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# Sri Indu

College of Engineering & Technology

UGC Autonomous Institution

Recognized under 2(f) & 12(B) of UGC Act 1956,

NAAC, Approved by AICTE &

Permanently Affiliated to JNTUH



## NAAC

NATIONAL ASSESSMENT AND  
ACCREDITATION COUNCIL



# HANDOUT

## III Year II Semester

DEPARTMENT OF INFORMATION  
TECHNOLOGY

ACADEMIC YEAR 2024-2025



# SRIINDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

(Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi and Accredited by NBA, NAAC)  
Sheriguda Village, Ibrahimpatnam Mandal, Ranga Reddy Dist. – 501 510

## DEPARTMENT OF INFORMATION TECHNOLOGY

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# SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

## B. TECH –INFORMATION TECHNOLOGY

### INSTITUTION VISION

To be a premier Institution in Engineering & Technology and Management with competency, values and social consciousness.

### INSTITUTION MISSION

**IM<sub>1</sub>** Provide high quality academic programs, training activities and research facilities.

**IM<sub>2</sub>** Promote Continuous Industry-Institute Interaction for Employability, Entrepreneurship, Leadership and Research aptitude among stakeholders.

**IM<sub>3</sub>** Contribute to the Economical and technological development of the region, state and nation.

### DEPARTMENT VISION

To be a recognized knowledge center in the field of Information Technology with self - motivated, employable engineers to society.

### DEPARTMENT MISSION

The Department has following Missions:

**DM<sub>1</sub>** To offer high quality student centric education in Information Technology.

**DM<sub>2</sub>** To provide a conducive environment towards innovation and skills.

**DM<sub>3</sub>** To involve in activities that provide social and professional solutions.

**DM<sub>4</sub>** To impart training on emerging technologies namely cloud computing and IOT with involvement of stake holders.

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1: Higher Studies:** Graduates with an ability to apply knowledge of Basic sciences and programming skills in their career and higher education.

**PEO2: Lifelong Learning:** Graduates with an ability to adopt new technologies for ever changing IT industry needs through Self-Study, Critical thinking and Problem solving skills.

**PEO3: Professional skills:** Graduates will be ready to work in projects related to complex problems involving multi-disciplinary projects with effective analytical skills.

**PEO4: Engineering Citizenship:** Graduates with an ability to communicate well and exhibit social, technical and ethical responsibility in process or product.

## PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)

PO	Description
PO 1	<b>Engineering Knowledge:</b> Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO 2	<b>Problem Analysis:</b> Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	<b>Design/Development of Solutions:</b> Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
PO 4	<b>Conduct Investigations of Complex Problems:</b> Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
PO 5	<b>Engineering Tool Usage:</b> Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO 6	<b>The Engineer and The World:</b> Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
PO 7	<b>Ethics:</b> Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	<b>Individual and Collaborative Team work:</b> Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	<b>Communication:</b> Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO 10	<b>Project Management and Finance:</b> Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO 11	<b>Life-Long Learning:</b> Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)
Program Specific Outcomes	
PSO 1	<b>Software Development:</b> To apply the knowledge of Software Engineering, Data Communication, Web Technology and Operating Systems for building IOT and Cloud Computing applications.
PSO 2	<b>Industrial Skills Ability:</b> Design, develop and test software systems for world-wide network of computers to provide solutions to real world problems.
PSO 3	<b>Project implementation:</b> Analyze and recommend the appropriate IT Infrastructure required for the implementation of a project.

## COURSE OUTCOMES (CO's)

**Academic Year:** 2024-25

**YEAR/SEM** : III -II

**Course Name** : AUTOMATA THEORY AND COMPILER DESIGN COURSE

**Sub Code** : R22CSM2212

At the end of the course student will be able to:

Course Outcomes	Statements
C321.1	Able to employ finite state machines for modeling and solving computing problems
C321.2	Able to design context free grammars for formal languages.
C321.3	Able to distinguish between decidability and un decidability.
C321.4	Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis
C321.5	Acquire skills in using lex tool and design LR parsers
C321.6	Understand intermediate code generation and run-time environment

## COURSE ARTICULATION MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2	PSO3
C321.1	2	-	1	3	3	-	-	-	-	-	-	-	-	1	-
C321.2	1	3	3	2	1	-	-	-	-	-	-	-	-	-	-
C321.3	1	3	3	1	1	-	-	-	-	-	-	-	-	-	-
C321.4	1	1	1	3	3	-	-	-	-	-	-	-	-	-	-
C321.5	3	-	2	1	3	-	-	-	-	-	-	-	-	1	-
C321.6	3	1	2	1	3	-	-	-	-	-	-	-	1	1	1
C321	1.83	2	2	1.83	2.33	-	-	-	-	-	-	-	1	1	1

# **AUTOMATA THEORY AND COMPILER DESIGN**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

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**(R22CSM2212) AUTOMATA THEORY AND COMPILER DESIGN**

**Course Objectives**

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

**Course Outcomes**

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

**UNIT – I :**

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA

**UNIT - II**

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages:** Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT - III**

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA and CFG's, Acceptance by final state

**Turing Machines:** Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

**UNIT - IV**

**Introduction:** The structure of a compiler,

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex,

**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

**UNIT - V**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2<sup>nd</sup> Edition, PHI.

**REFERENCE BOOKS:**

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, 2<sup>nd</sup> Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.



**SRI INDU COLLEGE OF ENGG &TECH**

(Regulation :R22)

**Department Of Information Technology**

**Sub. Code & Title**

**R22CSM2212 & Automata and Compiler Design**

**Academic Year: 2024-25**

**Year/Sem./Section III-II**

**Faculty Name & Designation**

**P. Swathi ,Assistant Professor**

**LESSON PLAN**

(L1-Remembering L2-Underst, ding,L3-Applying,L4-Analyzing,L5-Evaluation,L6-Creating)

Unit/Item No	Topic (s)	Book Reference	Page (s)		Teaching methodology	Proposed no of periods	Actual Date of Handled	CO/RBT
			From	To				
<b>UNIT-I</b>								
<b>I</b>	<b>PRELIMINARY CONCEPTS</b>					<b>12</b>		
1.1	Introduction to finite automata	T1	1	1	Black board	1		CO1/L1
1.2	Structural representation, automata and complexity	T1	1	5	Black board	1		CO1/L2
1.3	Automata theory concepts - alphabets, strings, languages	T1	28	31	Black Board	1		CO1/L2
1.4	An application of NFA	T1	68	69	Black board	1		CO2/L4
1.5	Text search	T1	70	72	Black board	1		CO2/L4
1.6	DFA problems	T1	55	59	Black board	2		CO2/L4
1.7	NFA, NFA problems	T1	45	48	Black board	2		CO2/L4
1.8	FA with epsilon transitions	T1	72	74	Black board	2		CO2/L4
1.9	Convert NFA with $\epsilon$ to without $\epsilon$	T1	75	77	Black board	1		CO2/L4
1.10	Convert NFA to DFA	T1	77	79	Black board	1		CO2/L4
	<b>Review</b>	<b>Signature of HOD/Coordinator</b>						
Unit/Item No	Topic (s)	Book Reference	Page (s)		Teaching methodology	Proposed no of periods	Actual Date of Handled	CO/RBT
			From	To				
<b>UNIT-II</b>								
<b>II</b>	<b>REGULAR EXPRESSIONS</b>					<b>10</b>		
2.1	Finite automata and regular expressions	T1	83	96	Black board	1		CO3/L3
2.2	Applications and algebraic laws of RE	T1	108	117	Black board	1		CO3/L3
2.3	Conversion of FA to RE	T1	101	106	Black board	2		CO3/L3
2.4	Pumping lemma and its applications	T1	126	127	Black board	2		CO3/L3
2.5	CFG-LMD, RMD	T1	169	175	Black board	2		CO4/L4
2.6	Parse Tree	T1	181	188	Black board	1		CO4/L5
2.7	Ambiguity	T1	205	212	Black board	1		CO4/L5
	<b>Review</b>	<b>Signature of HOD/Coordinator</b>						



**SRI INDU COLLEGE OF ENGG & TECH**

**(Regulation :R22)**

**Department Of Information Technology**

**Sub. Code & Title**      **R22CSM2212 & Automata and Compiler Design**

**Academic Year: 2024-25**      **Year/Sem./Section**      **III-II**

**Faculty Name & Designation**      **P.Swathi ,Assistant Professor**

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed no of periods	Actual Date of Handled	CO/RBT	
			From	To					
<b>UNIT-III</b>									
<b>III</b>	<b>PUSH DOWN AUTOMATA AND TURING MACHINE</b>					<b>9</b>			
3.1	PDA definition and languages	T1	219	224	Black board	1		CO6/L6	
3.2	Equivalence of PDA and CFG	T1	237	239	Black board	1		CO6/L6	
3.3	Turing machine def,language	T1	327	330	Black board	2		CO6/L6	
3.4	Turing machine Problem	T1	330	335	PPT	2		CO6/L6	
3.5	Undecidability in RE	T1	373	374	Black board	1		CO6/L6	
3.6	Undecidability in Turing machine	T1	374	375	Black board	2		CO6/L6	
	<b>Review</b>				<b>Signature of HOD/Coordinator</b>				
<b>UNIT-IV</b>									
<b>IV</b>	<b>COMPILERS</b>					<b>15</b>			
4.1	Compiler structure	R1	4	12	Black board	1		CO5/L1	
4.2	Lexical analyzer role	R1	109	116	Black board	1		CO5/L1	
4.3	Input buffering,token recognition	R1	374	375	Black board	1		CO5/L1	
4.4	LEX	R1	176	177	Black board	1		CO5/L1	
4.5	Syntax analysis grammer	R1	191	197	PPT	2		CO5/L2	
4.6	Top down parsing	R1	217	231	Black board	2		CO5/L2	
4.7	Bottom up parsing	R1	233	240	Black board	2		CO5/L1	
4.8	Simple LR parsing	R1	241	257	Black board	2		CO5/L2	
4.9	Powerful LR parsers	R1	250	277	Black board	2		CO5/L2	
	<b>Review</b>				<b>Signature of the HOD/Coordinator</b>				
<b>UNIT-V</b>									
<b>V</b>	<b>SYNTAX DIRECTED TRANSLATION</b>					<b>8</b>			
5.1	SDT definition and evaluation	R1	304	309	Black board	1		CO5/L6	
5.2	SDT schemes	R1	310	317	Black board	1		CO5/L6	
5.3	Implementing L attributed SDT	R1	337	352	Black board	1		CO5/L6	
5.4	Varients of syntax trees	R1	358	362	Black board	1		CO5/L6	
5.5	Three address code	R1	363	373	PPT	2		CO5/L6	
5.6	Stacks	R1	430	451	Black board	1		CO5/L6	
5.7	Heaps	R1	452	463	Black board	1		CO5/L6	
	<b>Review</b>				<b>Signature of the HOD/Coordinator</b>				

**TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2<sup>nd</sup> Edition, PHI.

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2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly Compiler Construction, Kenneth C. Loudon, Thomson. Course Technology.

**Web links**

W1: <https://www.javatpoint.com/theory-of-automata>

W2: [https://en.wikipedia.org/wiki/Automata\\_theory](https://en.wikipedia.org/wiki/Automata_theory)

W3: <https://www.geeksforgeeks.org/introduction-of-compiler-design/>

W4: <https://www.javatpoint.com/compiler-tutorial>

W5: [https://www.tutorialspoint.com/compiler\\_design/index.htm](https://www.tutorialspoint.com/compiler_design/index.htm)

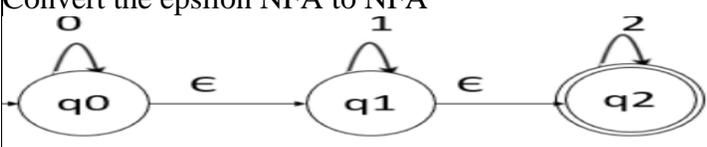
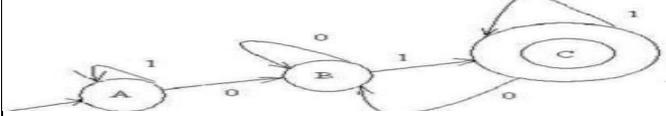
<b>SELF STUDY TOPICS</b>			
S.NO	TOPICS	BOOKS & JOURNALS	COURSE OUTCOMES
1.	Moore and Melay machines	Introduction to Automata Theory & Jeffrey D. Ullman, Pearson Education	CO1
2.	Push Down Automata	Introduction to Automata Theory & Jeffrey D. Ullman, Pearson Education	CO2

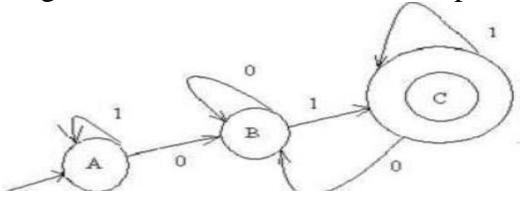
## MID-I ASSIGNMENT

### AUTOMATA THEORY AND COMPILER DESIGN (R22CSM2212)

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(1-5))	BT LEVEL	COURSE OUTCOMES
1	1	Construct a DFA to accept set of all strings ending with 010. Define language over an alphabet $\Sigma = \{0,1\}$ and write for the above DFA .	III	CO1
	2	Differentiate Moore and Melay Machine with an example.	IV	CO1
	3	Define DFA and write formal definition of DFA with an example	III	CO1
	4	Explain about algebraic laws of Regular Expression	II	CO2
	5	Show that the following CFG ambiguous. $S \rightarrow iCtS \mid iCtSeS \mid aC$ $\rightarrow b$	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(6-11))	BT LEVEL	COURSE OUTCOMES
2	1	Construct NFA for $(0 + 1)^*(00 + 11)(0 + 1)^*$ and Convert to DFA.	III	CO1
	2	Differentiate between DFA and NFA with an example	IV	CO1
	3	Convert given Finite Automata to Regular Expression using Arden's theorem with an example.	V	CO2
	4	Define Regular Expression. List out the applications of Regular Expression	II	CO2
5	Show that the following grammar is ambiguous with respect to the string aaabbabbba. $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid aB \rightarrow bS \mid aBB \mid b$	V	CO3	
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(12-16))	BT LEVEL	COURSE OUTCOMES
3	1	Construct a DFA to accept the language $L = \{w \mid w \text{ is of even length and begins with } 01\}$	III	CO1
	2	Explain NFA with suitable example	V	CO1
	3	Discuss about the closure properties of regular languages.	II	CO2
	4	What is pumping lemma explain its applications.	III	CO2
	5	Construct Leftmost Derivation. , Rightmost Derivation, Derivation Tree for the following grammar $G = (V, T, P, S)$ with $N = \{E\}$ , $S = E$ , $T = \{id, +, *, (\cdot)\}$ $E \rightarrow E + E$ $E \rightarrow E * E$ $E \rightarrow (E)$ $E \rightarrow id$ Obtain $id + id * id$ in right most derivation, left most derivation	V	C03

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(17-21))	BT LEVEL	COURSE OUTCOMES
4	1	Design DFA for the following languages shown below $\Sigma = \{a,b\}$ a. $L = \{w / w \text{ does not contain the substring } ab\}$ b. $L = \{w / w \text{ contains neither the substring } ab \text{ nor } ba\}$ c. $L = \{w / w \text{ is any string that doesn't contain exactly two } a\}$ d. $L = \{w / w \text{ is any string except } a \text{ and } b\}$	II	CO1
	2	Explain state elimination method with example	IV	CO1
	3	Explain about algebraic laws of Regular Expression.	II	CO2
	4	What is parse tree construct parse tree for the following $E \rightarrow E+E$ $E \rightarrow E * E$ $E \rightarrow (E)$ $E \rightarrow id$ Obtain $id+id*id$	II	CO2
	5	Show that the following CFG ambiguous. $S \rightarrow iCtS \mid iCtSeS \mid aC \rightarrow b$	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(22-26))	BT LEVEL	COURSE OUTCOMES
5	1	Differentiate between DFA and NFA with an example	IV	CO1
	2	Define push down automata and its language	III	CO1
	3	Convert given Finite Automata to Regular Expression using Arden's theorem with an example.	V	CO2
			II	CO2
	4	Define Regular Expression. List out the applications of Regular Expression	II	CO2
5	What is ambiguity in grammar explain with suitable example	V	CO3	
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(27-32))	BT LEVEL	COURSE OUTCOMES
	1	Explain NFA with epsilon moves with example	IV	CO1
	2	Explain Arden's method with an example	III	CO1
	3	Explain about algebraic laws of Regular Expression	II	CO2
6	4	Convert the epsilon NFA to NFA 	III	CO2
	5	Show that the following grammar is ambiguous with respect to the string aaabbabbba. $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid aB$ $B \rightarrow bS \mid aBB \mid b$	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(33-37))	BT LEVEL	COURSE OUTCOMES
	1	Differentiate between DFA and NFA with an example.	IV	CO1

7	2	Equivalence of CFG and PDA	V	CO1
	3	Explain the pumping lemma and its application with an example.	II	CO2
	4	Write short notes on 1.DFA 2.NFA 3.NFA epsilon	III	CO2
	5	What is ambiguity in grammar explain with suitable example	V	CO3
BATCH NO	SET NO	<b>ASSIGNMENT QUESTIONS(ROLL NO'S(38-42))</b>	BT LEVEL	COURSE OUTCOMES
8	1	Differentiate between DFA and NFA with an example	IV	CO1
	2	Construct a DFA to accept set of all strings ending with 010. Define language over an alphabet $\Sigma = \{ 0,1\}$ and write for the above DFA .	III	CO1
	3	Define Regular Expression. List out the applications of Regular Expression	II	CO2
	4	Convert the epsilon NFA to NFA 	II	CO2
	5	Show that the following grammar is ambiguous with respect to the string aaabbabbba. $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid a$ $B \rightarrow bS \mid aBB \mid b$	V	CO3
BATCH NO	SET NO	<b>ASSIGNMENT QUESTIONS(ROLL NO'S(43-47))</b>	BT LEVEL	COURSE OUTCOMES
9	1	 Convert given Finite Automata to Regular Expression using Arden's theorem with an example.	III	CO1
	2	Differentiate between DFA and NFA with an example	IV	CO1
	3	Define Regular Expression. List out the applications of Regular Expression	II	CO2
	4	Explain about algebraic laws of Regular Expression	II	CO2
	5	What is pumping lemma explain its applications.	V	CO3
BATCH NO	SET NO	<b>ASSIGNMENT QUESTIONS(ROLL NO'S(48-53))</b>	BT LEVEL	COURSE OUTCOMES
10	1	Construct a DFA to accept the language $L = \{ w \mid w \text{ is of even length and begins with } 01 \}$	III	CO1
	2	Explain PDA acceptance by final state	III	CO1
	3	Explain about algebraic laws of Regular Expression.	II	CO2

	4	Convert given Finite Automata to Regular Expression using Arden's theorem with an example. 	V	CO2
	5	Construct Leftmost Derivation. , Rightmost Derivation, Derivation Tree for the following grammar $G = (V, T, P, S)$ with $N = \{E\}$ , $S = E$ , $T = \{id, +, *, (\, )\}$ $E \rightarrow E + E$ $E \rightarrow E * E$ $E \rightarrow (E)$ $E \rightarrow id$ Obtain $id + id * id$ in right most derivation, left most derivation	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(54-58))	BT LEVEL	COURSE OUTCOMES
11	1	Differentiate NFA and DFA with an example.	IV	CO1
	2	Convert the epsilon NFA to NFA explain with example	III	CO1
	3	Explain about algebraic laws of Regular Expression	II	CO2
	4	Explain state elimination method with example	III	CO2
	5	Show that the following grammar is ambiguous with respect to the string $aaabbabbba$ . $S \rightarrow aB \mid bA$ $A \rightarrow aS \mid bAA \mid a$ $B \rightarrow bS \mid aBB \mid b$	V	CO3

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(59-63))	BT LEVEL	COURSE OUTCOMES
12	1	Construct a DFA to accept set of all strings ending with 010. Define language over an alphabet $\Sigma = \{ 0,1\}$ and write for the above DFA .	III	CO1
	2	.Define Regular Expression. List out the applications of Regular Expression	IV	CO1
	3	Define DFA and write formal definition of DFA with an example	III	CO2
	4	Explain about algebraic laws of Regular Expression.	II	CO2
	5	Explain PDA acceptance by final state	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(L2-L6))	BT LEVEL	COURSE OUTCOMES
13	1	Explain about algebraic laws of Regular Expression	III	CO1
	2	Explain state elimination method with example	IV	CO1
	3	Define Regular Expression. List out the applications of Regular Expression	II	CO2
	4	Define pumping lemma and write its applications	III	CO2
	5	Show that the following grammar is ambiguous with respect to the string aaabbabbba. $S \rightarrow aB \mid bA \quad A \rightarrow aS \mid bAA \mid a \quad B \rightarrow bS \mid aBB \mid b$	V	CO3

### MID-II ASSIGNMENT

#### AUTOMATA THEORY AND COMPILER DESIGN (R22CSM2212)

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(1-5))	BT LEVEL	COURSE OUTCOMES
1	1	Explain structure of a compiler with neat diagram	III	CO1
	2	Explain the following A) compiler B)Linker and loader	IV	CO1
	3	Explain LL(1) parser with an example	III	CO1
	4	Explain LR(0) parser with an example	II	CO2
	5	Define and describe Syntax Directed Definition	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(6-11))	BT LEVEL	COURSE OUTCOMES
2	1	What is Lexical Analysis?Explain the role of Lexical Analyzer	III	CO1
	2	Explain LL(1) parser with an example	IV	CO1
	3	Define and describe context free grammar with an example	V	CO2
	4	What is parser?Explain different types of parser	II	CO2
	5	What is SDD?Describe the evaluation order for SDD	V	CO3

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(12-16))	BT LEVEL	COURSE OUTCOMES
3	1	Explain input buffering in Lexical Analysis	III	CO1
	2	Explain LL(1) parser with an example	V	CO1
	3	What is derivation? Explain different types of derivation	II	CO2
	4	Define SDD and write SDD schema	III	CO3
	5	Explain about Lexical Analyzer Generator LEX	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(17-21))	BT LEVEL	COURSE OUTCOMES
4	1	Explain LL(1) parser with an example	II	CO1
	2	Explain design of Lexical Analyzer Generator	IV	CO1
	3	What is back tracking explain with an example	II	CO2
	4	Explain LR parsing with suitable example	II	CO2
	5	Define and describe Syntax Directed Definition	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(22-26))	BT LEVEL	COURSE OUTCOMES
5	1	Explain structure of a compiler with neat diagram	IV	CO1
	2	Explain turing machine with example	III	CO1
	3	Define and discuss about top down parser	V	CO2
	4	Explain LL(1) parser with an example	II	CO2
	5	What is SDD? Describe the evaluation order for SDD	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(27-32))	BT LEVEL	COURSE OUTCOMES
6	1	Explain the following A) Turing machine B) Undecidability	IV	CO1
	2	Explain the structure of a compiler	III	CO1
	3	Explain top down parser	II	CO2
	4	Explain SLR(1) parser with example	III	CO2
	5	Define SDD and write SDD schema	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(33-37))	BT LEVEL	COURSE OUTCOMES
7	1	What is Lexical Analysis? Explain the role of Lexical Analyze	IV	CO1
	2	Explain the following A) Compiler B) interpreter C) Assembler	V	CO1
	3	Explain CLR parser with example	II	CO2
	4	What is parse tree? Draw parse tree for given grammar and input string is a+b*c E-->E+T E-->E*T E-->T T-->a/b/c	III	CO2
	5	Define SDD and write SDD schema	V	CO3

BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(38-42))	BT LEVEL	COURSE OUTCOMES
8	1	Explain input buffering in Lexical Analysis	IV	CO1
	2	Define and describe undecidability	III	CO1
	3	Explain LR parser with an example	II	CO2
	4	What is ambiguity?The following grammar is ambiguous or not input string a+b*c E-->E+T E-->E*T E-->T T-->a/b/c	II	CO2
	5	Define and describe Syntax Directed Definition	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(43-47))	BT LEVEL	COURSE OUTCOMES
9	1	Define and describe Syntax Directed Definition	III	CO1
	2	Explain design of Lexical Analyzer Generator	IV	CO1
	3	Explain LALR(1) parser with an exaple	II	CO2
	4	Explain turing machine with example	II	CO2
	5	Explain the following A) compiler B)Linker and loader	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(48-53))	BT LEVEL	COURSE OUTCOMES
10	1	Explain about Lexical Analyzer Generator LEX	III	CO1
	2	What is derivation?Explain different types of derivation	III	CO1
	3	Explain SLR parser with example	II	CO2
	4	Define and describe Syntax Directed Definition	V	C03
	5	Explain turing machine with example	V	CO2
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(54-58))	BT LEVEL	COURSE OUTCOMES
11	1	Explain structure of a compiler with neat diagram	IV	CO1
	2	Explain undecidability with example	III	CO1
	3	Explain about run time allocation	II	CO2
	4	Explain LL(1) parser with an example	III	CO2
	5	What is SDD?Describe the evaluation order for SDD	V	CO3
BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(59-64))	BT LEVEL	COURSE OUTCOMES
	1	Explain input buffering in Lexical Analysis	III	CO1

12	2	What is stack and explain stack allocation	IV	CO1
	3	Explain SLR(1) parser with example	III	CO2
	4	What is parse tree? Draw parse tree for given grammar and input string is a+b*c F-->E+T E-->E*T F-->T T-->a/b/c	II	CO2
	5	Define SDD and write SDD schema	V	CO3
	BATCH NO	SET NO	ASSIGNMENT QUESTIONS(ROLL NO'S(L1-L5))	BT LEVEL
13	1	Explain structure of a compiler with neat diagram	III	CO1
	2	Explain the following A) compiler B) Linker and loader	IV	CO1
	3	Explain turing machine with example	II	CO2
	4	Explain LL(1) parser with an example	III	CO2
	5	What is SDD? Describe the evaluation order for SDD	V	CO3

	<b>SRI INDU COLLEGE OF ENGINEERING &amp; TECHNOLOGY</b> <b>Question Bank</b> <b>(Regulation: R22)</b> <b>Department of Information Technology</b>		Prepared on <b>2025</b>
	<b>Sub. Code &amp; Title</b>	<b>R22CSM2212 – Automata Theory And Compiler Design</b>	
	<b>Academic Year: 2024-25</b>	<b>Year/Semester</b>	<b>III/II</b>
	<b>Faculty Name &amp; Designation</b>		<b>P.SWATHI, Assistant Professor</b>

### UNIT – I

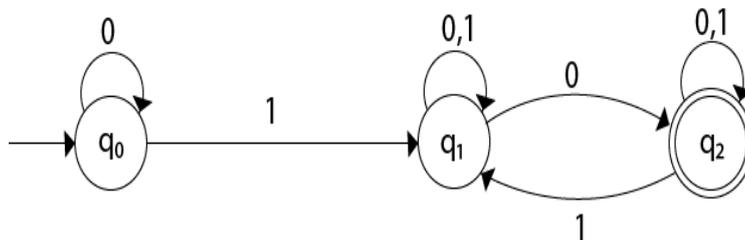
#### OBJECTIVE QUESTIONS

SL.NO		BT Level	Course Outcome
1C - 1	An Automata is (A) plural form of Automaton (B) abstract computing device (C) abstract model (D) all of the above	<b>I</b>	<b>CO1</b>
1C - 2	Which of the following is powerful? (A) Turing machine (B) NFA (C) DFA (D) B and C	<b>I</b>	<b>CO1</b>
1C - 3	Finite Automata are a useful model for (A) hardware (B) software (C) lexical analyzer (D) all of the above	<b>I</b>	<b>CO1</b>
1C - 4	Finite Automata defines (A) infinite states (B) finite states (C) initial state (D) final state	<b>I</b>	<b>CO1</b>
1C - 5	Which of the following represents Alphabet? (A) $\Sigma$ (B) Q (C) A (D) $\epsilon$	<b>I</b>	<b>CO1</b>
1C - 6	Which of the following is not true? (A) NFA is not capable as DFA (B) NFA and DFA are equal capable (C) we can convert NFA to DFA (D) finite Automata accepts Regular languages	<b>I</b>	<b>CO1</b>
1C - 7	NFA Represented by (A) 6 Tuples (B) 3 Tuples (C) 5 Tuples (D) 7 Tuples	<b>I</b>	<b>CO1</b>
1C - 8	The value of $ 1101 $ is (A) 2 (B) 3 (C) 4 (D) 5	<b>II</b>	<b>CO1</b>

1C - 9	Which of the statements is incorrect? (A) Symbols on alphabet are infinite (B) Strings on alphabet are infinite (C) Terminal are denoted by small letters (D) Variables are also known as Non-terminals	I	CO1
1C - 10	Which of the following is used to represent Automata by graph? (A) table (B) Transition diagram (C) pie-chart (D) none	I	CO1
1C - 11	In Automata theory a problem is the question of deciding (A) complexity (B) membership in a language (C) string type (D) A and C	II	CO1
1C - 12	Which of the following is an application of DFA? (A) Search engine (B) paint (C) Text Search (D) A and C	I	CO1
1C - 13	A string is (A) set of symbols (B) infinite symbols (C) only one symbol (D) finite length sequence of symbols	I	CO1
1C - 14	Number of initial states in NDA (A) 4 (B) 2 (C) 1 (D) 0	I	CO1
1C - 15	Number of Final states in Automata (A)1 (B) 2 (C) 1 or more than 1 (D) infinite	II	CO1
<b>FILL IN THE BLANKS</b>			
1F - 1	Automata theory is the study of _____	I	CO1
1F - 2	Regular languages are accepted by _____ Automata	II	CO1
1F - 3	Expansion of NFA _____	I	CO1
1F - 4	_____ language is a language over any alphabet	III	CO1
1F - 5	_____ indicates empty string	I	CO1
1F - 6	Reason to study automata _____	I	CO1
1F - 7	The the set of strings of length 2 over alphabet a,b _____	I	CO1
1F - 8	A string also known as _____	I	CO1
1F - 9	_____ is a Tabular Representation of a function	I	CO1
1F - 10	_____ has the power to be in several states at once	II	CO1
1F - 11	_____ contributes nothing to the string along the path	I	CO1
1F - 12	----- number of states required to accept string ends with 01	I	CO1

1F - 13	Language of finite automata is type _____	<b>I</b>	<b>CO1</b>	
1F - 14	Finite Automata Require number of stacks_____	<b>I</b>	<b>CO1</b>	
1F - 15	Regular Expression for all strings start with ab and ends with bba is _____	<b>V</b>	<b>CO1</b>	
<b>MATCH THE FOLLOWING</b>				
1M - 1	<ol style="list-style-type: none"> <li>1. Terminal</li> <li>2. Non-terminal</li> <li>3. Empty string</li> <li>4. Empty language</li> <li>5. Initial state</li> </ol>	<ol style="list-style-type: none"> <li>a. B</li> <li>b. a</li> <li>c. <math>q_0</math></li> <li>d. <math>\epsilon</math></li> <li>e. <math>\emptyset</math></li> </ol>	<b>III</b>	<b>CO1</b>
1M - 2	<ol style="list-style-type: none"> <li>1. Finite Automata</li> <li>2. Automata</li> <li>3. NFA</li> <li>4. DFA</li> <li>5. String</li> </ol>	<ol style="list-style-type: none"> <li>a. No Epsilon transition</li> <li>b. Language Acceptor</li> <li>c. word</li> <li>d. Epsilon transition</li> <li>e. Abstract device</li> </ol>	<b>III</b>	<b>CO1</b>
1M - 3	<ol style="list-style-type: none"> <li>1. <math>\Sigma</math></li> <li>2. <math>\delta</math></li> <li>3. <math>q_0</math></li> <li>4. <math>Q</math></li> </ol>	<ol style="list-style-type: none"> <li>a. finite set of input symbols</li> <li>b. Subset of <math>Q</math></li> <li>c. initial state</li> <li>d. transition function</li> <li>e. set of final states</li> </ol>	<b>I</b>	<b>CO1</b>
1M - 4	<ol style="list-style-type: none"> <li>1. Alphabet</li> <li>2. Language</li> <li>3. String</li> <li>4. Empty String</li> <li>5. Concatenation</li> </ol>	<ol style="list-style-type: none"> <li>a. set of strings</li> <li>b. set of symbols</li> <li>c. list of symbols</li> <li>d. <math>xy</math></li> <li>e. zero</li> </ol>	<b>II</b>	<b>CO1</b>
1M - 5	<ol style="list-style-type: none"> <li>1. Type 0 Automata</li> <li>2. Type 3 Automata</li> <li>3. DFA</li> <li>4. NFA</li> <li>5. TM</li> </ol>	<ol style="list-style-type: none"> <li>a. Regular grammar</li> <li>b. More powerful than</li> <li>c. Un restricted grammar</li> <li>d. accepts Epsilon</li> <li>e. does not accept Epsilon</li> </ol>	<b>II</b>	<b>CO1</b>
<b>5 – MARKS QUESTIONS</b>				
1D - 1	Define Finite Automata , and list out the uses of Finite Automata	<b>I</b>	<b>CO1</b>	
1D - 2	Why do we study Automata Theory .Discuss about Automata Theory	<b>IV</b>	<b>CO1</b>	
1D - 3	Elaborate notations that play an important role in the study of automata and their applications	<b>VI</b>	<b>CO1</b>	
1D - 4	Discuss the following a) Grammars b) Regular Expressions	<b>II</b>	<b>CO1</b>	
1D - 5	Analyze about the Automata and Complexity	<b>III</b>	<b>CO1</b>	
1D - 6	Analyze the following a) Alphabet b) Strings c) Languages d) Grammar	<b>IV</b>	<b>CO1</b>	
1D - 7	Explain NFA with an example	<b>II</b>	<b>CO1</b>	
1D - 8	Explain about DFA	<b>V</b>	<b>CO1</b>	
1D - 9	Compare DFA and NFA	<b>II</b>	<b>CO1</b>	
1D - 10	What is Transition Diagram? Give an example	<b>I</b>	<b>CO1</b>	

1D - 11	Discuss Finite Automata with Epsilon transitions	<b>III</b>	<b>CO1</b>
1D - 12	Write in detail about Applications of NFA	<b>I</b>	<b>CO1</b>
1D - 13	Discuss about how DFA Process Strings, in detail	<b>IV</b>	<b>CO1</b>
1D - 14	Evaluate the steps in converting NFA to DFA with Example	<b>V</b>	<b>CO1</b>
1D - 15	Convert the given NFA to DFA	<b>III</b>	<b>CO1</b>



## UNIT – II

### OBJECTIVE QUESTIONS

SL.NO		BT Level	Course Outcome
2C - 1	Which of the following operations is NOT supported in regular expressions? a) Concatenation b) Exponentiation c) Union d) Kleene star	<b>I</b>	<b>CO2</b>
2C - 2	Which of the following regular expressions represents the language of all strings over {0,1} that do not contain '11' as a substring? a) (0+1)* b) (0+1)11(0+1) c) (0+1)(0+11) d) (01)*	<b>I</b>	<b>CO2</b>
2C - 3	Which of the following regular expressions represents an empty language? a) $\emptyset$ b) $\epsilon$ c) (0+1)* d) (0+1)+	<b>I</b>	<b>CO2</b>
2C - 4	Which operation in regular expressions is used to represent alternatives? a) Concatenation b) Kleene star c) Union d) Intersection	<b>II</b>	<b>CO2</b>
2C - 5	What does the regular expression "a b" represent? a) Either 'a' or 'b' b) String containing 'a' followed by 'b' c) String containing 'a' and 'b' d) String containing 'a' or 'b'	<b>I</b>	<b>CO2</b>
2C - 6	What does the regular expression "a*" represent? a) Strings containing only 'a'	<b>II</b>	<b>CO2</b>

	<p>b) Strings containing at least one 'a'</p> <p>c) Strings containing zero or more 'a's</p> <p>d) Strings containing exactly one 'a'</p>		
2C - 7	<p>What does a context-free grammar consist of?</p> <p>a) Terminals, production rules, start symbol</p> <p>b) Terminals, non-terminals, start symbol</p> <p>c) Terminals, production rules, regular expressions</p> <p>d) Terminals, non-terminals, regular expressions</p>	<b>I</b>	<b>CO2</b>
2C - 8	<p>Which notation is commonly used to represent non-terminals in a context-free grammar?</p> <p>a) Uppercase letters</p> <p>b) Lowercase letters</p> <p>c) Alphanumeric characters</p> <p>d) Symbols enclosed in square brackets</p>	<b>I</b>	<b>CO2</b>
2C - 9	<p>What does the start symbol represent in a context-free grammar?</p> <p>a) The symbol used to begin each production rule</p> <p>b) The first non-terminal symbol in the grammar</p> <p>c) The initial state in parsing</p> <p>d) The symbol used to terminate each production rule</p>	<b>I</b>	<b>CO2</b>
2C - 10	<p>Which of the following describes the language generated by a context-free grammar?</p> <p>a) Regular languages</p> <p>b) Context-sensitive languages</p> <p>c) Context-free languages</p> <p>d) Turing machines</p>	<b>III</b>	<b>CO2</b>
2C - 11	<p>What is the purpose of using recursion in context-free grammars?</p> <p>a) To generate infinitely long strings</p> <p>b) To represent looping constructs</p> <p>c) To allow non-terminals to expand into themselves</p> <p>d) To ensure termination of parsing</p>	<b>I</b>	<b>CO2</b>
2C - 12	<p>Which of the following is NOT a valid operation in context-free grammars?</p> <p>a) Union</p> <p>b) Concatenation</p> <p>c) Kleene closure</p> <p>d) Intersection</p>	<b>I</b>	<b>CO2</b>
2C - 13	<p>In a context-free grammar, what does <math>\epsilon</math> represent?</p> <p>a) Empty string</p> <p>b) End of input</p> <p>c) Start of input</p> <p>d) Epsilon transition</p>	<b>II</b>	<b>CO2</b>
2C - 14	<p>Which of the following is used to denote the production of multiple alternatives in a context-free grammar?</p> <p>a) Curly braces { }</p> <p>b) Square brackets [ ]</p>	<b>II</b>	<b>CO2</b>

	c) Angle brackets $\langle \rangle$ d) Pipe symbol		
2C - 15	Context-free grammars are commonly associated with which type of automaton? a) Deterministic Finite Automaton (DFA) b) Non-deterministic Finite Automaton (NFA) c) Pushdown Automaton (PDA) d) Turing Machine	<b>II</b>	<b>CO2</b>
<b>FILL IN THE BLANKS</b>			
2F - 1	The regular expression _____ represents the language of all strings over $\{0,1\}$ that start with '1'.	<b>I</b>	<b>CO2</b>
2F - 2	The regular expression _____ denotes zero or more occurrences of the preceding character 'a'.	<b>II</b>	<b>CO2</b>
2F - 3	The regular expression _____ matches strings containing any number of 'a's followed by any number of 'b's.	<b>I</b>	<b>CO2</b>
2F - 4	The regular expression _____ denotes one or more occurrences of the preceding character 'c'.	<b>I</b>	<b>CO2</b>
2F - 5	A grammar is _____ used to generate strings in a language. It consists of a finite set of symbols	<b>I</b>	<b>CO2</b>
2F - 6	A language is _____ over some alphabet. It can be finite or infinite.	<b>II</b>	<b>CO2</b>
2F - 7	Regular languages can be recognized by _____.	<b>I</b>	<b>CO2</b>
2F - 8	The _____ lemma is a fundamental result in the theory of regular languages.	<b>I</b>	<b>CO2</b>
2F - 9	Every regular language can be expressed by a _____ expression.	<b>I</b>	<b>CO2</b>
2F - 10	The union, concatenation, and Kleene star operations are closed under _____.	<b>I</b>	<b>CO2</b>
2F - 11	Terminals are symbols that appear in the _____ strings of the language.	<b>I</b>	<b>CO2</b>
2F - 12	Non-terminals are symbols that can be replaced by groups of _____ according to the rules of the grammar.	<b>III</b>	<b>CO2</b>
2F - 13	Productions (or rules) specify how _____ can be replaced by combinations of terminals and other non-terminals.	<b>I</b>	<b>CO2</b>
2F - 14	Context-free grammars are used to describe _____ languages.	<b>III</b>	<b>CO2</b>
2F - 15	A context-free grammar consists of a set of _____	<b>I</b>	<b>CO2</b>
<b>MATCH THE FOLLOWING</b>			
2M - 1	1. $(0+1)0$ 2. $(00+11)$ 3. $(0+1)(0+1)$ 4. $01$ a. Matches strings containing an even number of '0's and an even number of '1's. b. Matches strings containing '0's followed by '1's. c. Matches strings containing alternating '0's and '1's.	<b>II</b>	<b>CO2</b>

	d. Matches strings ending with '0'.		
2M - 2	1. V            a. Start Symbol 2. T            b. Set of Variables 3. P            c. Terminal 4. S            d. Production Rules	<b>I</b>	<b>CO2</b>
2M - 3	1. Recursive enumerable languages    a. Finite Automata 2. Context Sensitive Grammar            b. PDA 3. Context free Grammar                 c. LBA 4. Regular Grammar                         d. Turing Machine	<b>III</b>	<b>CO2</b>
2M - 4	1. Stack DS                                  a. Gives an infinite set of all possible strings of any length 2. Queue DS                                 b. PDA 3. Pumping Lemma                         c. Used to prove that given language is not regular 4. Kleen Closure.                         d. LBA	<b>IV</b>	<b>CO2</b>
2M - 5	1. Identity for union                        a. Epsilon 2. Identity for concatenation             b. Theta 3. Idempotent law                            c. L+M=M+L 4. Commutative law                         d. L Union L	<b>III</b>	<b>CO2</b>
<b>5 – MARKS QUESTIONS</b>			
2D - 1	What is Regular Expression? Discuss Finite automata with Regular Expression	<b>I</b>	<b>CO2</b>
2D - 2	List and Explain Applications of Regular Expressions	<b>III</b>	<b>CO2</b>
2D - 3	What is the Transition Diagram and strings for the given Regular Expression $01^*+10^*$	<b>V</b>	<b>CO2</b>
2D - 4	Evaluate the Operators of Regular Expressions with example	<b>V</b>	<b>CO2</b>
2D - 5	How Regular Expression approach is different from Finite Automata for describing languages	<b>IV</b>	<b>CO2</b>
2D - 6	Explain Relation ship between Finite Automata and Regular Expression with Diagram	<b>II</b>	<b>CO2</b>
2D - 7	Convert the given Regular Expression $1^*01(0+11)^*$ into DFA Transition Diagram	<b>I</b>	<b>CO2</b>
2D - 8	List and Explain Applications of Regular expressions	<b>I</b>	<b>CO2</b>
2D - 9	What are the algebraic laws that are used for Regular Expressions	<b>II</b>	<b>CO2</b>
2D - 10	Evaluate the steps in conversion of finite automata to Regular Expression.	<b>V</b>	<b>CO2</b>
2D - 11	What do you mean by Pumping Lemma? What are the Applications of Pumping Lemma.	<b>I</b>	<b>CO2</b>
2D - 12	Create Context free Grammar. Explain the components of CFG	<b>VI</b>	<b>CO2</b>
2D - 13	Explain Leftmost and Rightmost Derivations of CFG with Examples	<b>VI</b>	<b>CO2</b>
2D - 14	What is Parse Tree? How to construct Parse Tree	<b>I</b>	<b>CO2</b>
2D - 15	Evaluate Ambiguity in Grammar? How to remove Ambiguity for the Grammar	<b>V</b>	<b>CO2</b>
<b>UNIT – III</b>			
<b>OBJECTIVE QUESTIONS</b>			
	Which of the following is NOT a component of a pushdown		

3C - 1	<p>automaton (PDA)?</p> <ol style="list-style-type: none"> <li>Finite control</li> <li>Input tape</li> <li>Stack</li> <li>Transition function</li> </ol>	<b>I</b>	<b>CO3</b>
3C - 2	<p>What is the main difference between a finite automaton (FA) and a pushdown automaton (PDA)?</p> <ol style="list-style-type: none"> <li>FA has an input tape, while PDA doesn't.</li> <li>PDA has a stack, while FA doesn't.</li> <li>FA can recognize context-free languages, while PDA can't.</li> <li>PDA can recognize regular languages, while FA can't.</li> </ol>	<b>II</b>	<b>CO3</b>
3C - 3	<p>In a PDA, the stack allows for:</p> <ol style="list-style-type: none"> <li>LIFO (Last-In-First-Out) operations</li> <li>FIFO (First-In-First-Out) operations</li> <li>Both LIFO and FIFO operations</li> <li>Random access operations</li> </ol>	<b>I</b>	<b>CO3</b>
3C - 4	<p>Which of the following describes the type of languages recognized by pushdown automata?</p> <ol style="list-style-type: none"> <li>Regular languages</li> <li>Context-free languages</li> <li>Context-sensitive languages</li> <li>Unrestricted languages</li> </ol>	<b>I</b>	<b>CO3</b>
3C - 5	<p>What is the role of the stack in a pushdown automaton?</p> <ol style="list-style-type: none"> <li>To store the input symbols.</li> <li>To store intermediate results during computation</li> <li>To represent the state transitions.</li> <li>To handle memory management.</li> </ol>	<b>II</b>	<b>CO3</b>
3C - 6	<p>Which of the following describes the type of languages recognized by pushdown automata?</p> <ol style="list-style-type: none"> <li>Regular languages</li> <li>Context-free languages</li> <li>Context-sensitive languages</li> <li>All of the above</li> </ol>	<b>I</b>	<b>CO3</b>
3C - 7	<p>Which of the following operations can a pushdown automaton perform?</p> <ol style="list-style-type: none"> <li>Reading input symbols</li> <li>Pushing symbols onto the stack</li> <li>Popping symbols from the stack</li> <li>All of the above</li> </ol>	<b>I</b>	<b>CO3</b>
3C - 8	<p>Turing machines are capable of recognizing which type of languages?</p> <ol style="list-style-type: none"> <li>Regular languages</li> <li>Context-free languages</li> <li>Context-sensitive languages</li> <li>Recursively enumerable languages</li> </ol>	<b>II</b>	<b>CO3</b>
3C - 9	<p>In a Turing machine, the tape is initially:</p> <ol style="list-style-type: none"> <li>Empty</li> <li>Contains the input string</li> <li>Contains only the start symbol</li> <li>Contains random symbols</li> </ol>	<b>I</b>	<b>CO4</b>
3C - 10	<p>The set of states in a Turing machine includes:</p> <ol style="list-style-type: none"> <li>Start state only</li> <li>Accept state only</li> </ol>	<b>I</b>	<b>CO4</b>

	<ul style="list-style-type: none"> <li>c) Reject state only</li> <li>d) Start, accept, and reject states</li> </ul>		
3C - 11	<p>What is the Turing machine's response when it halts in an accept state?</p> <ul style="list-style-type: none"> <li>a) Accepts the input string</li> <li>b) Rejects the input string</li> <li>c) Continues computation</li> <li>d) None of the above</li> </ul>	<b>IV</b>	<b>CO4</b>
3C - 12	<p>In a non-deterministic Turing machine (NTM), a transition can have:</p> <ul style="list-style-type: none"> <li>a) Exactly one possible outcome</li> <li>b) Multiple possible outcomes</li> <li>c) No outcome</li> <li>d) A different alphabet</li> </ul>	<b>I</b>	<b>CO4</b>
3C - 13	<p>The concept of Turing machines is fundamental in understanding:</p> <ul style="list-style-type: none"> <li>a) Computability theory</li> <li>b) Artificial intelligence</li> <li>c) Data structures</li> <li>d) Digital circuits</li> </ul>	<b>II</b>	<b>CO4</b>
3C - 14	<p>Which of the following problems is known to be undecidable ?</p> <ul style="list-style-type: none"> <li>a) Sorting a list of integers</li> <li>b) Determining whether a given context-free grammar generates an infinite language</li> <li>c) Finding the shortest path in a weighted graph</li> <li>d) Solving systems of linear equations</li> </ul>	<b>I</b>	<b>CO4</b>
3C - 15	<p>Undecidability implies that there are problems for which:</p> <ul style="list-style-type: none"> <li>a) No solution exists</li> <li>b) Only approximate solutions exist</li> <li>c) No algorithm can guarantee a correct solution for all instances</li> <li>d) Only deterministic solutions exist</li> </ul>	<b>IV</b>	<b>CO4</b>
<b>FILL IN THE BLANKS</b>			
3F - 1	In a pushdown automaton (PDA), the finite control, input tape, and stack collectively form the _____.	<b>I</b>	<b>CO3</b>
3F - 2	Pushdown automata are capable of recognizing languages beyond those recognized by _____.	<b>IV</b>	<b>CO3</b>
3F - 3	The stack in a pushdown automaton (PDA) allows for _____ operations.	<b>I</b>	<b>CO3</b>
3F - 4	The type of languages recognized by pushdown automata are known as _____ languages	<b>IV</b>	<b>CO3</b>
3F - 5	An $\epsilon$ -transition in a pushdown automaton allows the machine to read an input symbol without _____ any input.	<b>I</b>	<b>CO3</b>
3F - 6	A pushdown automaton can perform operations such as reading input symbols, pushing symbols onto the stack, and _____ symbols from the stack	<b>I</b>	<b>CO3</b>
3F - 7	In a Turing machine, the _____ is the main control unit responsible for determining the machine's behavior based on its current state and the symbol read from the tape	<b>IV</b>	<b>CO3</b>
3F - 8	The tape in a Turing machine is divided into _____ cells, where each cell can hold a single symbol from the tape alphabet.	<b>I</b>	<b>CO3</b>

3F - 9	The function of the _____ is to transition the Turing machine from one state to another based on the current state and symbol read from the tape.	<b>II</b>	<b>CO4</b>								
3F - 10	Turing machines are central to the study of _____ theory, which deals with the fundamental capabilities and limitations of computational devices.	<b>I</b>	<b>CO4</b>								
3F - 11	The set of states in a Turing machine includes a _____ state, which indicates the initial state of the machine.	<b>I</b>	<b>CO4</b>								
3F - 12	Undecidability refers to the property of a problem for which no algorithm exists to determine a _____ answer.	<b>I</b>	<b>CO4</b>								
3F - 13	The concept of undecidability was formally established by the proof of the _____ theorem	<b>I</b>	<b>CO4</b>								
3F - 14	Undecidability is a fundamental limitation of _____.	<b>V</b>	<b>CO4</b>								
3F - 15	The concept of undecidability challenges the notion that all problems can be solved with sufficient _____ resources	<b>I</b>	<b>CO4</b>								
<b>MATCH THE FOLLOWING</b>											
3M - 1	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. Push</td> <td style="width: 50%;">a. add a symbol onto the top of the stack.</td> </tr> <tr> <td>2. Pop</td> <td>b. remove the symbol from the top of the stack</td> </tr> <tr> <td>3. Read</td> <td>c. examine the current symbol on the input tape</td> </tr> <tr> <td>4. Accept</td> <td>d. State reached when the stack is empty.</td> </tr> </table>	1. Push	a. add a symbol onto the top of the stack.	2. Pop	b. remove the symbol from the top of the stack	3. Read	c. examine the current symbol on the input tape	4. Accept	d. State reached when the stack is empty.	<b>I</b>	<b>CO3</b>
1. Push	a. add a symbol onto the top of the stack.										
2. Pop	b. remove the symbol from the top of the stack										
3. Read	c. examine the current symbol on the input tape										
4. Accept	d. State reached when the stack is empty.										
3M - 2	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. Finite Control</td> <td style="width: 50%;">a. Stores symbols</td> </tr> <tr> <td>2. Stack</td> <td>b. Determines the next move.</td> </tr> <tr> <td>3. Input Tape</td> <td>c. Controls the behavior</td> </tr> <tr> <td>4. Transition Function</td> <td>d. Allows for the storage of symbols</td> </tr> </table>	1. Finite Control	a. Stores symbols	2. Stack	b. Determines the next move.	3. Input Tape	c. Controls the behavior	4. Transition Function	d. Allows for the storage of symbols	<b>I</b>	<b>CO3</b>
1. Finite Control	a. Stores symbols										
2. Stack	b. Determines the next move.										
3. Input Tape	c. Controls the behavior										
4. Transition Function	d. Allows for the storage of symbols										
3M - 3	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. Read</td> <td style="width: 50%;">a. Examines the current symbol on the tape</td> </tr> <tr> <td>2. Write .</td> <td>b. Modifies the symbol currently under the tape head</td> </tr> <tr> <td>3. Move</td> <td>c. Changes the position of the tape head</td> </tr> <tr> <td>4. Transition</td> <td>d. Determines the next move</td> </tr> </table>	1. Read	a. Examines the current symbol on the tape	2. Write .	b. Modifies the symbol currently under the tape head	3. Move	c. Changes the position of the tape head	4. Transition	d. Determines the next move	<b>II</b>	<b>CO3</b>
1. Read	a. Examines the current symbol on the tape										
2. Write .	b. Modifies the symbol currently under the tape head										
3. Move	c. Changes the position of the tape head										
4. Transition	d. Determines the next move										
3M - 4	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. Non-determinism</td> <td style="width: 50%;">a. it can have multiple possible transitions</td> </tr> <tr> <td>2. Determinism</td> <td>b. it can recognize and simulate any other Turing machine.</td> </tr> <tr> <td>3. Unboundedness</td> <td>c. tape being infinite in length.</td> </tr> <tr> <td>4. Universality</td> <td>d. uniquely determined</td> </tr> </table>	1. Non-determinism	a. it can have multiple possible transitions	2. Determinism	b. it can recognize and simulate any other Turing machine.	3. Unboundedness	c. tape being infinite in length.	4. Universality	d. uniquely determined	<b>I</b>	<b>CO4</b>
1. Non-determinism	a. it can have multiple possible transitions										
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3. Unboundedness	c. tape being infinite in length.										
4. Universality	d. uniquely determined										
3M - 5	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. RE</td> <td style="width: 50%;">a. Universal language</td> </tr> <tr> <td>2. 2. Recursive language problems</td> <td>b. Un-decidable</td> </tr> <tr> <td>3. 3.Non-recursive language</td> <td>c. Turing Machine</td> </tr> <tr> <td>4. 4.Lu</td> <td>d. Decidable Problems</td> </tr> </table>	1. RE	a. Universal language	2. 2. Recursive language problems	b. Un-decidable	3. 3.Non-recursive language	c. Turing Machine	4. 4.Lu	d. Decidable Problems	<b>I</b>	<b>CO4</b>
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3. 3.Non-recursive language	c. Turing Machine										
4. 4.Lu	d. Decidable Problems										
<b>5 – MARKS QUESTIONS</b>											
3D - 1	Evaluate Push Down Automata and Explain each component of PDA	<b>V</b>	<b>CO3</b>								

3D - 2	What are the different Approaches by which a language can be accepted by PDA	<b>II</b>	<b>CO3</b>
3D - 3	How to Construct PDA From the given Grammar	<b>II</b>	<b>CO3</b>
3D - 4	Convert the Grammar $S \rightarrow 0AA$ $A \rightarrow 0S/1S/0$ into PDA that accepts the same language by empty stack	<b>I</b>	<b>CO3</b>
3D - 5	How to Evaluate Turing Machine .Describe the Turing Machine with Diagram	<b>V</b>	<b>CO3</b>
3D - 6	Explain each notation of Turing Machine. give some examples of problems that can and cannot be solved by a Turing machine?	<b>II</b>	<b>CO3</b>
3D - 7	Discuss the concept of computability and its relationship to Turing machines.	<b>II</b>	<b>CO3</b>
3D - 8	Discuss the halting problem for Turing machines. Explain why it is undecidable, and explore its significance in theoretical computer science.	<b>IV</b>	<b>CO3</b>
3D - 9	Explore the connection between Turing machines and formal language theory. Discuss how Turing machines are used to define and recognize formal languages.	<b>II</b>	<b>CO4</b>
3D -10	Design a Turing machine to compute a specific function or solve a particular problem. Explain the machine's states, transition function, and tape alphabet, and analyze its computational complexity.	<b>I</b>	<b>CO4</b>
3D -11	Explain the concept of undecidability in the theory of computation.	<b>I</b>	<b>CO4</b>
3D -12	Provide examples of undecidable problems and discuss the implications of undecidability for computer science.	<b>II</b>	<b>CO4</b>
3D -13	Explain Undecidable problems about Turing machines	<b>II</b>	<b>CO4</b>
3D -14	Define the following a) Undecidability b) Undecidable Problems	<b>II</b>	<b>CO4</b>
3D -15	What are the Classes of Languages that are accepted by Turing Machine	<b>II</b>	<b>CO4</b>

**UNIT-IV**

**OBJECTIVE QUESTIONS**

<b>SL.NO</b>		<b>BT Level</b>	<b>Course Outcome</b>
4C - 1	What is the primary function of a compiler? a) Interpretation of source code b) Execution of machine code c) Translation of high-level code to machine code d) Debugging of programs	<b>II</b>	<b>CO5</b>
4C - 2	Which phase of the compiler translates the source code into intermediate code?	<b>II</b>	<b>CO5</b>

	<ul style="list-style-type: none"> <li>a) Lexical Analysis</li> <li>b) Syntax Analysis</li> <li>c) Semantic Analysis</li> <li>d) Intermediate Code Generation</li> </ul>		
4C - 3	<p>Which phase of the compiler checks for syntax errors and constructs a parse tree?</p> <ul style="list-style-type: none"> <li>a) Lexical Analysis</li> <li>b) Syntax Analysis</li> <li>c) Semantic Analysis</li> <li>d) Code Generation</li> </ul>	<b>I</b>	<b>CO5</b>
4C - 4	<p>Which phase of compilation involves associating attributes with syntactic constructs?</p> <ul style="list-style-type: none"> <li>a) Lexical Analysis</li> <li>b) Syntax Analysis</li> <li>c) Semantic Analysis</li> <li>d) Intermediate Code Generation</li> </ul>	<b>I</b>	<b>CO5</b>
4C - 5	<p>Types of Parsers</p> <ul style="list-style-type: none"> <li>a) 2</li> <li>b) 3</li> <li>c) 4</li> <li>d) 5</li> </ul>	<b>I</b>	<b>CO5</b>
4C - 6	<p>Which of the following is true about L-Attributed Syntax-Directed Definitions?</p> <ul style="list-style-type: none"> <li>a) They cannot handle inherited attributes</li> <li>b) They can handle both inherited and synthesized attributes</li> <li>c) They can only handle synthesized attributes</li> <li>d) They are used exclusively for code optimization</li> </ul>	<b>I</b>	<b>CO5</b>
4C - 7	<p>Which of the following is parser(s)</p> <ul style="list-style-type: none"> <li>a) Top down Parser</li> <li>b) Bottom up parser</li> <li>c) Universal Parser</li> <li>d) All of the above</li> </ul>	<b>I</b>	<b>CO5</b>
4C - 8	<p>Function of Symbol table is</p> <ul style="list-style-type: none"> <li>a) Error handling</li> <li>b) Maintain Record of each variable</li> <li>c) Both a and b</li> <li>d) None</li> </ul>	<b>II</b>	<b>CO5</b>
4C - 9	<p>Which of the following comes under synthesis phase</p> <ul style="list-style-type: none"> <li>a) Semantic Analysis</li> <li>b) Code generation</li> <li>c) Lexical Analysis</li> <li>d) Syntax Analysis</li> </ul>	<b>I</b>	<b>CO5</b>

4C - 10	Which phase of compilation involves associating attributes with syntactic constructs? a) Lexical Analysis b) Syntax Analysis c) Semantic Analysis d) Intermediate Code Generation	I	CO5
4C - 11	What is the primary role of semantic actions in Syntax-Directed Translation? a) To generate intermediate code b) To specify attribute evaluation rules c) To construct parse trees d) To perform code optimization	I	CO5
4C - 12	Function of Lexical Analyzer is a) Read input of Source code b) Type checking c) Code conversion d) optimization	I	CO5
4C - 13	Context Free Grammar accepted by which automaton a) Turing Machine b) LBA c) PDA d) Finite Automaton	II	CO5
4C - 14	Which of the following is/are Compiler Construction tool a) Parser generator b) Scanner generator c) Code generator d) All of the above	II	CO5
4C - 15	A Grammar consists of a) Terminals b) Non-terminals c) Start symbol, Productions d) All of the above	I	CO5

**FILL IN THE BLANKS**

4F - 1	1. The primary function of a compiler is to translate high-level code into _____ code.	I	CO5
4F - 2	_____ is the phase of the compiler responsible for constructing a parse tree and checking for syntax errors.	I	CO5
4F - 3	The role of the _____ is to identify tokens and lexemes in the source code.	II	CO5
4F - 4	Context-Free Grammars are primarily used in the _____ phase of the compiler	II	CO5
4F - 5	Semantic Analysis is the phase of the compiler responsible for checking for _____ errors.	I	CO5
4F - 6	The process of identifying keywords and identifiers is performed during _____.	II	CO5
4F - 7	LR Parsing is more powerful than _____ parsing.	II	CO5
4F - 8	LALR stands for _____.	I	CO5
4F - 9	Type checking is performed during _____.	II	CO5

4F - 10	Evaluation orders for SDDs can vary, such as ____ or ____.	<b>V</b>	<b>CO5</b>
4F - 11	Three-Address Code typically consists of ____ operands.	<b>I</b>	<b>CO5</b>
4F - 12	Run-Time Environments manage memory and access to data during program execution, including ____.	<b>I</b>	<b>CO5</b>
4F - 13	Syntax-Directed Translation involves associating ____ with the productions of a grammar.	<b>I</b>	<b>CO5</b>
4F - 14	Flex is a tool commonly used to generate ____ analyzers.	<b>II</b>	<b>CO5</b>
4F - 15	LR Parsing is a type of ____ parsing.	<b>III</b>	<b>CO5</b>

**MATCH THE FOLLOWING**

4M - 1	<ol style="list-style-type: none"> <li>1. Lexical Analysis</li> <li>2. Syntax Analysis</li> <li>3. Semantic Analysis</li> <li>4. Intermediate form</li> </ol>	<ol style="list-style-type: none"> <li>a. Parsing</li> <li>b. Type checking</li> <li>c. Three address code</li> <li>d. Scanning</li> </ol>	<b>I</b>	<b>CO5</b>
4M - 2	<ol style="list-style-type: none"> <li>1. Code Optimization</li> <li>2. Code generation</li> <li>3. Symbol table compilation</li> <li>4. Error Handling variable</li> </ol>	<ol style="list-style-type: none"> <li>a. Maps to target Language</li> <li>b. improves the Intermediate code</li> <li>c. done at every phase of compilation</li> <li>d. Contains a record of each variable</li> </ol>	<b>I</b>	<b>CO5</b>
4M - 3	<ol style="list-style-type: none"> <li>1. Lexeme Patterns</li> <li>2. Token</li> <li>3. Pattern</li> <li>4. Lexeme</li> </ol>	<ol style="list-style-type: none"> <li>a. Sequence of Characters</li> <li>b. Lexical Analyzer</li> <li>c. Name, Attribute</li> <li>d. Description of the form</li> </ol>	<b>II</b>	<b>CO5</b>
4M - 4	<ol style="list-style-type: none"> <li>1. Top-down Parser</li> <li>2. Bottom- up Parser</li> <li>3. LALR</li> <li>4. Lexical Analyzer</li> </ol>	<ol style="list-style-type: none"> <li>a. Read input of source code</li> <li>b. LL parser</li> <li>c. LR Parser</li> <li>d. Look ahead LR</li> </ol>	<b>II</b>	<b>CO5</b>
4M - 5	<ol style="list-style-type: none"> <li>1. Parse Tree Input</li> <li>2. Ambiguous Grammar</li> <li>3. LR parser</li> <li>4. Yaac Parse Tree</li> </ol>	<ol style="list-style-type: none"> <li>a. Left to Right scanning of</li> <li>b. Picture of Derivation</li> <li>c. Parse generator</li> <li>d. Produce more than One</li> </ol>	<b>III</b>	<b>CO5</b>

**5 – MARKS QUESTIONS**

4D - 1	Provide an overview of the structure of a compiler. What are the main components, and what role does each component play in the compilation process?	<b>II</b>	<b>CO5</b>
4D - 2	Explain the purpose and operation of the lexical analyzer (lexer) in a compiler.?	<b>II</b>	<b>CO5</b>
4D - 3	Describe the process of tokenization performed by the lexical analyzer	<b>III</b>	<b>CO5</b>
4D - 4	What are tokens, and how does the lexer identify and classify different types of tokens	<b>I</b>	<b>CO5</b>
4D - 5	Describe the following a) Context Free Grammar	<b>II</b>	<b>CO5</b>

	b) Symbol table		
4D - 6	What is Compiler? What are the functions performed by Compiler	<b>III</b>	<b>CO5</b>
4D - 7	What is the Role of Lexical Analyzer in Lexical Analysis phase	<b>IV</b>	<b>CO5</b>
4D - 8	What is Parsing? Explain Top-down and Bottom-up parsing	<b>I</b>	<b>CO5</b>
4D - 9	What do you Mean by LR Parsing? Describe various LR parsers	<b>I</b>	<b>CO5</b>
4D - 10	Describe the following a) Input buffer b) Lex	<b>I</b>	<b>CO5</b>
4D - 11	Explain Syntax Analysis phase in Compilation	<b>I</b>	<b>CO5</b>
4D - 12	Briefly describe the structure of a compiler with Diagram	<b>I</b>	<b>CO5</b>
4D - 13	Analyze the role of LR parsing table in the parsing process, particularly The actions and goto function	<b>V</b>	<b>CO5</b>
4D - 14	Evaluate the process of constructing an LR parsing table and the Challenges involved in this process	<b>V</b>	<b>CO5</b>
4D - 15	Explain the primary concept of LR Parsing, in contrast to LL parsing	<b>I</b>	<b>CO5</b>

**UNIT - V**

**OBJECTIVE QUESTIONS**

<b>SL.NO</b>		<b>BT Level</b>	<b>Course Outcome</b>
5C - 1	What is the primary purpose of Syntax-Directed Definitions (SDDs)? a) Generating machine code directly b) Describing the syntax of programming languages c) Associating attributes with syntactic constructs d) Optimizing intermediate code	<b>II</b>	<b>CO6</b>
5C - 2	Which of the following is NOT a type of attribute in Syntax-Directed Translation? a) Synthesized b) Inherited c) Semantic d) L-Attributed	<b>I</b>	<b>CO6</b>
5C - 3	What are Syntax-Directed Translation Schemes (SDTS) used for? a) Parsing input strings b) Generating machine code c) Associating attributes with productions in a grammar d) Constructing parse trees	<b>I</b>	<b>CO6</b>
5C - 4	What is the main advantage of using intermediate code in a compiler? a) It simplifies the implementation of code optimization techniques	<b>II</b>	<b>CO6</b>

	<ul style="list-style-type: none"> <li>b) It reduces the complexity of semantic analysis</li> <li>c) It allows for easier integration of external libraries</li> <li>d) It improves the performance of the generated machine code</li> </ul>		
5C - 5	<p>What is the relationship between Syntax-Directed Definitions (SDDs) and context-free grammars?</p> <ul style="list-style-type: none"> <li>a) SDDs are more powerful than context-free grammars</li> <li>b) SDDs are a type of context-free grammar</li> <li>c) Context-free grammars are a type of SDD</li> <li>d) SDDs are unrelated to context-free grammars</li> </ul>	<b>II</b>	<b>CO6</b>
5C - 6	<p>What does a Syntax-Directed Translation Scheme (SDTS) specify?</p> <ul style="list-style-type: none"> <li>a) A set of rules for constructing parse trees</li> <li>b) A set of rules for associating attributes with grammar productions</li> <li>c) A set of rules for generating machine code</li> <li>d) A set of rules for lexical analysis</li> </ul>	<b>II</b>	<b>CO6</b>
5C - 7	<p>In Syntax-Directed Translation, what is the purpose of the evaluation order?</p> <ul style="list-style-type: none"> <li>a) To determine the order of attribute evaluation</li> <li>b) To determine the order of grammar rule application</li> <li>c) To determine the order of parse tree construction</li> <li>d) To determine the order of code optimization</li> </ul>	<b>II</b>	<b>CO6</b>
5C - 8	<p>What is the primary advantage of using Three-Address Code (TAC) over other intermediate representations?</p> <ul style="list-style-type: none"> <li>a) It is easier to generate from source code</li> <li>b) It is more compact and efficient</li> <li>c) It is easier to optimize</li> <li>d) It is easier to interpret</li> </ul>	<b>I</b>	<b>CO6</b>
5C - 9	<p>Which of the following is true about L-Attributed Syntax-Directed Definitions?</p> <ul style="list-style-type: none"> <li>a) They cannot handle inherited attributes</li> <li>b) They can handle both inherited and synthesized attributes</li> <li>c) They can only handle synthesized attributes</li> <li>d) They are used exclusively for code optimization</li> </ul>	<b>II</b>	<b>CO6</b>
5C - 10	<p>What is an inherited attribute in Syntax-Directed Translation?</p> <ul style="list-style-type: none"> <li>a) An attribute inherited from the parent node to its children</li> <li>b) An attribute inherited from the children to the parent node</li> <li>c) An attribute that is synthesized from the children</li> <li>d) An attribute that is synthesized from the parent</li> </ul>	<b>II</b>	<b>CO6</b>
5C - 11	<p>In a run-time environment, what is the role of the heap?</p> <ul style="list-style-type: none"> <li>a) To store local variables and function parameters</li> <li>b) To store global variables and static data</li> <li>c) To manage memory dynamically allocated during program execution</li> <li>d) To maintain a record of function calls and return addresses</li> </ul>	<b>I</b>	<b>CO6</b>
5C - 12	<p>What is the difference between static and dynamic memory allocation?</p> <ul style="list-style-type: none"> <li>a) Static memory allocation is performed at compile time, while dynamic memory allocation is performed at run time</li> <li>b) Static memory allocation involves allocating memory on the stack, while dynamic memory allocation involves allocating memory on the heap</li> <li>c) Static memory allocation is more efficient than dynamic memory allocation</li> <li>d) Static memory allocation requires explicit deallocation, while dynamic memory allocation does not</li> </ul>	<b>I</b>	<b>CO6</b>

5C -13	What is the purpose of heap management in a run-time environment? a) To allocate memory for local variables b) To allocate memory for global variables c) To manage dynamically allocated memory d) To optimize stack space usage	I	CO6	
5C -14	Which of the following is NOT a common method for heap management? a) First-fit allocation b) Best-fit allocation c) Quick-fit allocation d) Stack-based allocation	II	CO6	
5C -15	What is a potential downside of heap-based memory allocation? a) It can lead to fragmentation of memory b) It requires more memory than stack allocation c) It is slower than stack allocation d) It can cause stack overflow errors	II	CO6	
<b>FILL IN THE BLANKS</b>				
5F - 1	Syntax-Directed Translation involves associating ____ with the productions of a grammar.	I	CO6	
5F - 2	Run-Time Environments manage memory and access to data during program execution, including ____.	I	CO6	
5F - 3	Stack Allocation of Space involves allocating memory for ____.	II	CO6	
5F - 4	Heap Management deals with allocating and deallocating memory for ____.	I	CO6	
5F - 5	Syntax-Directed Translation Schemes are used to ____ semantic actions with productions.	I	CO6	
5F - 6	Run-Time Environments handle aspects like ____ and ____.	II	CO6	
5F - 7	Stack Allocation of Space is efficient for ____ with a fixed lifetime.	I	CO6	
5F - 8	In a syntax-directed definition, ____ are associated with grammar symbols.	I	CO6	
5F - 9	Access to Nonlocal Data on the Stack requires efficient ____ mechanisms.	I	CO6	
5F - 10	Three-Address Code facilitates ____ for various architectures.	I	CO6	
5F - 11	Run-Time Environments ensure proper ____ and ____ of resources.	I	CO6	
5F - 12	DAG stands for_____	I	CO6	
5F - 13	In_____ there is at most one operator on the right side of an Instruction	I	CO6	
5F - 14	Type checking can take on two forms_____and _____-	I	CO6	
5F - 15	_____Environment deals with a variety of issues such as the layout and allocation of storage locations.	II	CO6	
<b>MATCH THE FOLLOWING</b>				
5M - 1	1. Heap 2. Memory manager 3. Garbage collection 4. Mutator	a. Allocates / Deallocates space b. finds the space with in the heap c. modifies the collection of objects in the heap. d. portion of store	III	CO6

5M - 2	1.DAG a. op,arg1, arg2 2.Triples b. syntax trees 3.type checking c. data structure with named field 4. Record d. behavior of a program	<b>III</b>	<b>CO6</b>
5M - 3	1. SDD a. when two type expressions equals 2. Annotated parse tree b. depicts the flow of information 3. Dependency graph c. showing values of it's attributes 4. Type equivalence d. Context free Grammar	<b>II</b>	<b>CO6</b>
5M - 4	1. Three address code a. Memory management 2. Runtime management b. Optimization phase 3. SDD c. Associate Semantic actions 4. SDT d. Semantic actions	<b>II</b>	<b>CO6</b>
5M - 5	1. Local variable stored a. Run time 2. Activation Record b. Compile time 3. Static Memory allocation c. Data Structure holds information about current function call 4. Dynamic Memory allocation d. on the stack	<b>II</b>	<b>CO6</b>
<b>5 – MARKS QUESTIONS</b>			
5D - 1	What is SDD? Explain the attributes of SDD	<b>II</b>	<b>CO6</b>
5D - 2	Illustrate the Dependency graph with Example	<b>III</b>	<b>CO6</b>
5D - 3	Describe the following a) S-attributed SDD b) L-attributed SDD	<b>II</b>	<b>CO6</b>
5D - 4	Define DAG. What is the corresponding DAG for the given Expression $a+a*(b-c)+(b-c)*d$	<b>II</b>	<b>CO6</b>
5D - 5	What is Three address code? Give an example	<b>II</b>	<b>CO6</b>
5D - 6	What is Heap? What are functions performed by Heap Manager	<b>II</b>	<b>CO6</b>
5D - 7	Explain the concept of Syntax directed Translation and how it differs from direct interpretation of the source code	<b>II</b>	<b>CO6</b>
5D - 8	Discuss the basic principles of Syntax directed translation	<b>II</b>	<b>CO6</b>
5D - 9	Compare and Contrast SDD and SDT	<b>II</b>	<b>CO6</b>
5D - 10	Explain about Syntax directed Translation Schemes	<b>V</b>	<b>CO6</b>
5D - 11	Explain the following a) Dependency graph b) S-attributed and L-attributed Definitions	<b>II</b>	<b>CO6</b>
5D - 12	Explain Storage organization of Run time Environment	<b>I</b>	<b>CO6</b>
5D - 13	Give the evaluation order of SDT with an example	<b>II</b>	<b>CO6</b>
5D - 14	Describe the following a) Activation trees b) Activation Records	<b>I</b>	<b>CO6</b>
5D - 15	illustrate Static versus Dynamic storage allocation of data and the Memory Hierarchy of Computer	<b>II</b>	<b>CO6</b>



## SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956.

III B.Tech, I Semester (REGULAR) End Examinations, JANUARY- 2025.

(R22CSM2212) AUTOMATA THEORY AND COMPILER DESIGN

07/01/2025

(For IoT)

Day-4(FN)

Duration: 3 HrsMaximum Marks: 60M

Blooms Taxonomy : (I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating and VI-Creating)

Course Outcomes : CO

### PART - A

Answer ALL the following questions.

(10Qx1M=10M)

- |    |   |     |     |
|----|---|-----|-----|
| 1. | a) How does an NFA differ from a DFA?   | II  | CO1 |
|    | b) How does an epsilon transition differ from a regular transition in an NFA? | III | CO1 |
|    | c) Define a Regular expression.   | II  | CO1 |
|    | d) Explain the concept of a Parse tree in CFGs.                               | I   | CO1 |
|    | e) What type of language does a Pushdown Automaton accept?                    | I   | CO1 |
|    | f) What is a Recursively enumerable language?                                 | II  | CO3 |
|    | g) Mention the role of the front end in a compiler.                           | I   | CO4 |
|    | h) How does a lexical analyzer recognize tokens?                              | II  | CO4 |
|    | i) What is the difference between Synthesized and Inherited attributes?       | III | CO5 |
|    | j) What is an Abstract syntax tree?   | II  | CO5 |

### PART - B

Answer FIVE questions choosing at least one from each unit.

(5Qx10M=50M)

#### UNIT-I

- 2a. Describe the different components of finite automata, including states, transitions, and accept states, with a labeled diagram with examples. III CO1

(OR)

- 2b. Define Deterministic Finite Automata (DFA) and explain how it processes strings with a simple example. III CO1

#### UNIT-II

- 3a. Using the Pumping Lemma, demonstrate that the language  $L = \{a^n b^n \mid n \geq 0\}$  is not regular. Explain each step. II CO2

(OR)

- 3b. Convert the given finite automaton to a regular expression and explain each step of your process. V CO2

$$Q = \{q_0, q_1, q_2\}, \quad \Sigma = \{a, b\}, \quad q_0 \rightarrow q_1 \xrightarrow{a} q_2, \quad q_2 \rightarrow q_0$$

#### UNIT-III

- 4a. Construct a PDA for the language  $L = \{a^n b^n \mid n \geq 1\}$ , where the PDA accepts by final state. Clearly explain each step in the PDA's operation for an example string "aabb". III CO3

(OR)

- 4b. Compare the operation of a deterministic Turing Machine with that of a Non-deterministic Turing Machine. IV CO3

P.T.O

UNIT-IV

5a. Compare and contrast recursive descent and predictive parsing as two forms of top-down parsing. IV CO4

(OR)

5b. Construct the CLR parsing table for the following grammar: V CO4  
 $S \rightarrow L=R \mid R$   
 $L \rightarrow *R \mid id$   
 $R \rightarrow L$ .

UNIT-V

6a. Write the quadruple, triple, indirect triple for the given expression. IV CO5  
 $-(a*b) + (c + d) - (a + b + c + d)$ .

(OR)

6b. Explain in detail how an L-attributed grammar can be converted into a translation scheme. V CO5

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**Duration: 3 Hrs****Max Marks: 60 M****Section – A**

Answer <u>All</u> of the following questions		Marks: 10Qx1M = 10M		
		Marks	Course Outcome	BT Level
1	What is Automata Theory ?	1	CO1	I
2	Define Transition diagram ?	1	CO1	I
3	Discuss Regular Expression	1	CO2	VI
4	How Regular Expression approach is different from Finite Automata for describing languages	1	CO2	IV
5	Give some examples of problems that can be solved by a Turing machine?	1	CO3	II
6	Define Push Down Automata and List each component of PDA	1	CO4	I
7	What are tokens, and how does the lexer identify and classify different types of tokens	1	CO5	I
8	Explain Syntax Analysis phase in Compilation	1	CO5	V
9	What is SDD? Explain the attributes of SDD	1	CO6	I
10	Discuss the basic principles of Syntax directed translation	1	CO6	II

**Section – B**

Answer any <u>FIVE</u> questions choosing at least one from each Unit		Marks: 5Qx10M = 50M		
		Marks	Course Outcome	BT Level
<b>UNIT-I</b>				
11. Why do we study Automata Theory .Discuss about Automata Theory	(OR)	10	CO1	VI,V
12. Evaluate the steps in converting NFA to DFA with Example				
<b>UNIT-II</b>				
13. What is Regular Expression? Discuss Finite automata with Regular Expression	(OR)	10	CO2	I,III
14. What do you mean by Pumping Lemma? What are the				

Applications of Pumping Lemma.			
<p style="text-align: center;"><b>UNIT – III</b></p> <p>15. Convert the Grammar  <math>S \rightarrow 0AA</math>  <math>A \rightarrow 0S/1S/0</math> into PDA that accepts the same language by empty stack  <b>(OR)</b></p> <p>16. Provide examples of undecidable problems and discuss the implications of undecidability for computer science.</p>	10	CO3 CO4	III,IV
<p style="text-align: center;"><b>UNIT – IV</b></p> <p>17. Provide an overview of the structure of a compiler. What are the main components, and what role does each component play in the compilation process?  <b>(OR)</b></p> <p>18. Evaluate the process of constructing an LR parsing table and the Challenges involved in this process</p>	10	CO5	I,V
<p style="text-align: center;"><b>UNIT – V</b></p> <p>19. Define DAG. What is the corresponding DAG for the given Expression  <math>a+a*(b-c)+(b-c)*d</math>  <b>(OR)</b></p> <p>20. illustrate Static versus Dynamic storage allocation of data and the Memory Hierarchy of Computer</p>	10	CO6	I,II

S.NO	Bloom Taxonomy Level	No. Of. Questions	%	Name & Signature of Paper Setter
1	Fundamental Knowledge from level I & II	5	50	
2	Knowledge on application & Analysis from level III & IV	2	20	

3	Critical thinking and ability to design from level V & VI	3	30	
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## COs MAPPING WITH POs & PSOs

Academic Year :2022-23

Class :III YEAR, II SEM.

Course Name :ALGORITHM DESIGN AND ANALYSIS (R20INF3202)

At the end of the course student will be able to:

Course Outcomes	Statements
C322.1	Analyzing the algorithms and improve the efficiency of algorithms(Analyze)
C322.2	Different Designing methods for development of algorithms to realistic problems(Apply)
C322.3	Describe and estimate the performance of algorithms(understand)
C322.4	Evaluate the problems by using Greedy method and Dynamic Programming approach onvarious applications(Evaluate)
C322.5	Evaluate the problems by using Back tracking,Branch and bound on various Applications(Evaluate)
C322.6	Evaluate the problems of Deterministic and Nondeterministic Polynomial(Evaluate)

### Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2	PSO3
C322.1	2	3	2	2	-	-	-	-	-	-	1	1	2	1	1
C322.2	2	2	2	1	-	-	-	-	-	-	1	1	2	1	1
C322.3	2	2	1	2	-	-	-	-	-	-	1	1	2	1	1
C322.4	2	2	2	1	-	-	-	-	-	-	1	1	2	1	1
C322.5	2	2	1	2	-	-	-	-	-	-	1	1	2	1	1
C322.6	2	2	1	1	-	-	-	-	-	-	1	1	-	-	-
C322	2.0	2.16	1.5	1.5	-	-	-	-	-		1.0	1.0	2	1	1

# ACADEMIC YEAR 2024-25



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
 (An Autonomous Institution under UGC, New Delhi)  
 NBA & SAAC Accredited, Approved by AICTE and Recognized by Institute of Technical Education  
 Sheriguda (V), Brahmipatnam, R.R. Dist, Hyderabad - 501 510

D4

BR-22

Lr.No.SICET/AUTO/DAE/III B.Tech Academic Calendar/85/2024

## **B.TECH III-YEAR I-SEM & II-SEM ACADEMIC CALENDAR (FOR ACADEMIC YEAR : 2024-25)**

**Academic Calendar for B.Tech – III<sup>rd</sup> Year Students (2022 - 23 Batch), BR-22 Regulation,**

### **I – Semester**

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	22.07.2024 (Monday)	
2.	1 <sup>st</sup> Spell of Instructions for covering First Two and a half Units (Including CRT training Classes)	22.07.2024 – 28.09.2024	10 Weeks
3.	I Mid Term Examinations.	30.09.2024 – 05.10.2024	5 Days
4.	Submission of I Mid Term Examination Marks.	09.10.2024	
5.	2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	14.10.2024 – 14.12.2024	9 Weeks
6.	II Mid Term Examinations.	16.12.2024 – 18.12.2024	3 Days
7.	Preparation Holidays and Practical Examinations	19.12.2024 – 28.12.2024	1 Week 3 Days
8.	Submission of II Mid Term Examination Marks.	27.12.2024	
9.	I Semester End Examinations.	30.12.2024 – 18.01.2025	3 Weeks
<b>Commencement of Class-Work for III B.Tech - II Semester 20.01.2025 (Monday)</b>			

**Note:** No of Working/Instructional days : 99

### **II – Semester**

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	20.01.2025 (Monday)	
2.	1 <sup>st</sup> Spell of Instructions for covering First Two and a half Units.	20.01.2025 – 22.03.2025	9 Weeks
3.	I Mid Term Examinations.	24.03.2025 – 26.03.2025	3 Days
4.	Submission of I Mid Term Examination Marks.	02.04.2025	
5.	2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	27.03.2025 – 10.05.2025	6 Weeks 3 Days
6.	Summer Vacation	12.05.2025 – 24.05.2025	2 Weeks
7.	Continuation of 2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	26.05.2025 – 11.06.2025	2 Weeks 3 Days
8.	II Mid Term Examinations.	12.06.2025 – 14.06.2025	3 Days
9.	Preparation Holidays and Practical Examinations	16.06.2025 – 21.06.2025	1 Week
10.	Submission of II Mid Term Examination Marks.	19.06.2025	
11.	II Semester End Examinations	23.06.2025 – 05.07.2025	2 Weeks
12.	Commencement of Class-Work for IV B.Tech - I Semester	07.07.2025 (Monday)	

**Note:** No of Working/Instructional days : 98

ACE

**Controller of Examination**  
 Sri Indu College of Engineering & Technology  
 (An Autonomous Institution Under UGC)  
 Sheriguda (V), Brahmipatnam, R.R. Dist-501510

**DIRECTOR**  
 Sri Indu College of Engineering & Technology  
 (An Autonomous Institution Under UGC)  
 Sheriguda (V), Brahmipatnam, R.R. Dist-501510

**PRINCIPAL**  
 Sri Indu College of Engineering & Technology  
 (An Autonomous Institution Under UGC)  
 Sheriguda (V), Brahmipatnam, R.R. Dist-501510

Sign:   
**Dr. M.V.S.S. Giridhar**  
 Prof. of CEA, JNTUH Nominee

Sign:   
**Dr. T. Venu Gopal**  
 Prof. of CSE, JNTUH Nominee

Sign:   
**Dr. D. Ramesh**  
 Prof. of CSE, JNTUH Nominee

(Copy to DAP&E and C-ry to all the Dept. Heads)

# **ALGORITHM DESIGN AND ANALYSIS**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

L	T	P	C
3	0	0	3

**(R22INF3212) ALGORITHM DESIGN AND ANALYSIS****Course Objectives:**

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best- case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

**Course Outcomes:**

- Ability to analyze the performance of algorithms
- Ability to choose appropriate data structures and algorithm design methods for a specified application
- Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

**UNIT - I****Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.**UNIT - II****Disjoint Sets:** Disjoint set operations, union and find algorithms**Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph coloring**UNIT - III****Dynamic Programming:** General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.**UNIT - IV****Greedy method:** General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.**UNIT - V****Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.**NP-Hard and Approximation Algorithms:** Non deterministic algorithms, NP - Hard and NP-Complete classes, Absolute Approximations – Planar Graph Coloring, Maximum Programs stored Problem, NP Hard Absolute Approximations.**TEXT BOOK:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

**REFERENCE BOOKS:**

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.



**SRI INDU COLLEGE OF ENGG & TECH**

**LESSON PLAN**

(Regulation :R22)

**Department of Information Technology**

**Prepared**

**On**

**Jan 2025**

**Sub.Code &Title**

**R22INF3212 & Algorithm Design and Analysis**

**AcademicYear:2024-25**

**Year/Sem./Section**

**III-II**

**Faculty Name & Designation**

**J.S.Radhika, Assistant Professor**

Unit/ Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No.of Periods	ActualDate of Handled	CO/RBT
			From	To				
<b>UNIT-I</b>								
<b>I</b>	<b>Introduction to Algorithms &amp; Divide and Conquer</b>					<b>11</b>		
1.1	Introduction to Algorithms	T1	1	4	Blackboard	01		CO1, L1
1.2	Performance Analysis–Space complexity, Time complexity	T1	14	26	Blackboard	01		CO1, ,L1
1.3	Asymptotic Notations	T1	39	47	Blackboard	02		CO1, L1
1.4	Divide and Conquer : General Method	T1	136	140	Blackboard	01		CO2, L3
1.5	Applications:Binary Search	T1	145	152	Blackboard	02		CO2,L3
1.6	Quick Sort	T1	168	174	Blackboard	01		CO2,L3
1.7	Merge Sort	T1	159	167	Blackboard	01		CO2,L3
1.8	Strassen’s Matrix Multiplications	T1	192	194	Blackboard	02		CO2,L3
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						
<b>UNIT-II</b>								
<b>II</b>	<b>Disjoint sets and Backtracking</b>					<b>10</b>		
2.1	Disjoint set operations	T1	110	119	Blackboard	01		CO3,L4
2.2	Union and Find Algorithms	T1	110	119	Black board	02		CO3,L4
2.3	<b>Backtracking:</b> General Method	T1	359	372	Blackboard	02		CO3,L4
2.4	Applications: N–Queen problem	T1	373	375	Blackboard	02		CO3, L4
2.5	Sum of Subsets Problem	T1	377	379	Blackboard	02		CO3,L4
2.6	Graph Coloring	T1	380	383	Blackboard	01		CO3, L4
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						



**SRI INDU COLLEGE OF ENGG & TECH**  
**LESSON PLAN**  
 (Regulation :R22)

**Prepared  
On  
Jan 2025**

**Department of Information Technology**

**Sub.Code &Title** R22INF3212 & Algorithm Design and Analysis

**AcademicYear:2024-25**

**Year/Sem./Section**

**AcademicYear:2024-25**

**Faculty Name & Designation**

**J.S.Radhika, Assistant Professor**

Unit/ Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No.of Periods	Actual Date of Handled	CO/RBT
<b>UNIT-III</b>								
<b>III</b>	<b>Dynamic programming</b>					<b>12</b>		
3.1	Dynamic Programming:General Method	T1	272	276	Blackboard	01		CO4, L5
3.2	Applications:	T1			Blackboard	01		CO4, L5
3.3	Optimal Binary Search Trees	T1	293	301	Blackboard	02		CO4, L5
3.4	0/1KnapsackProblem	T1	305	312	Blackboard	02		CO4, L5
3.5	All pairs Shortest Path Problem	T1	284	287	Blackboard	02		CO4, L5
3.6	Travelling Sales Person Problem	T1	318	320	Blackboard	02		CO4, L5
3.7	Reliability Design	T1	315	317	Blackboard	02		CO4, L5
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						
<b>UNIT-IV</b>								
<b>IV</b>	<b>Greedy Method</b>					<b>11</b>		
4.1	Greedy method: General Method	T1	210	213	Blackboard	01		CO5, L4
4.2	Applications: Job Sequencing with deadlines	T1	227	233	Blackboard	02		CO5, L4
4.3	Knapsack problem	T1	218	221	Blackboard	02		CO5, L4
4.4	Minimum Cost Spanning Trees	T1	236	246	Blackboard	04		CO5, L4
4.5	Single Source Shortest Path Problem	T1	260	266	Blackboard	02		CO5, L4
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						
<b>UNIT-V</b>								
<b>V</b>	<b>Branch and Bound &amp;NP Hard and NP Complete Problems</b>					<b>13</b>		
5.1	Branch and Bound : General method	T1	412	415	Blackboard	01		CO6,L2
5.2	Traveling salesperson problem	T1	416	417	Blackboard	02		CO6,L2
5.3	0/1 knapsack problem	T1	420	423	Blackboard	01		CO6,L2
5.4	LC Branch and Bound solution	T1	430	433	Blackboard	01		CO6,L2
5.5	FIFO Branch and Bound solution	T1	510	512	Blackboard	01		CO6,L2
5.6	Basic Concepts	T1	514	515	Blackboard	01		CO6,L2
5.7	Non Deterministic Algorithms	T1	515	523	Blackboard	01		CO6, L2
5.8	NP–Hard and NP Complete Classes	T1	523	526	Blackboard	02		CO6,L2
5.9	Planar Graph Coloring	T1	527	535	Blackboard	01		CO6,L2
5.10	Maximum Programs stored problem	T1	537	540	Blackboard	01		CO6,L2
5.11	NP Hard Absolute Approximations	T1	542	543	Blackboard	01		CO6,L2
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						

## **LIST OF TEXT BOOKS AND REFERENCES**

### **TEXT BOOKS:**

- T1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.
- T2. Foundations of Algorithm, 4<sup>th</sup> edition, R.Neapolitan and K.Naimipour, Jones and Barlett Learning
- T3. Design and Analysis of Algorithms, P.H.Dave, H.B.Dave, Pearson Education, 2008.

### **REFERENCE BOOKS:**

- R1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
- R2. Introduction to Algorithms, third edition, THOMAS H. COREMEN, CHARLE .E. LEISERSON, RONALD L. RIVEST, and CLIFFORD STEIN, PHI Pvt. Ltd./ Pearson Education.
- R3 Algorithm Design: Foundations, Analysis and Internet Examples, M.T.Goodrich and R. Tamassia, John Wiley and sons.
- R4. Computer Algorithms, Introduction to Design and Analysis, 3<sup>rd</sup> edition, Saara Baase, Van, Gelder , Pearson Education.
- R5 Fundamentals of Sequential and Parallel Algorithms, K.A.Bermanand J.L.Paul Comp Learning
- R6 Introduction to Algorithms, A.Levitin, Pearson Education.

### **Web links**

- W1. <http://www.engppt.com/search/label/Design%20and%20Analysis%20of%20Algorithms%20>.
- W2. <https://www.cs.princeton.edu/~wayne/kleinberg-tardos/>
- W3. <https://www.cmi.ac.in/~madhavan/nptel-algorithms-2015/>
- W4. <http://cs.uef.fi/pages/franti/asa/notes.html>
- W5. <https://myonlinetext.blogspot.com/2015/12/design-and-analysis-of-algorithms.html>
- W6. [https://docs.google.com/document/d/1S4a8PIYUBJLpBaIDCLDcztTj0dp\\_7-BxqZmTchQ8f8E/edit](https://docs.google.com/document/d/1S4a8PIYUBJLpBaIDCLDcztTj0dp_7-BxqZmTchQ8f8E/edit)

### **SELF STUDY TOPICS**

S.No.	Topics	Books & Journals	Course Outcomes
1	DATA STRUSTURES USING C	Data structures using c handbook by balaguruswamy	CO-6

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation:R22) Department of IT		<b>Prepared onRev1:</b>
	<b>Sub.Cod &amp; Title</b>	<b>R22INF3212&amp; ALGORITHM DESIGN AND ANALYSIS</b>	
	<b>AcademicYear:2024-25</b>	<b>Year/Sem</b>	<b>III/II</b>
	<b>Faculty Name &amp; Designation</b>	<b>J.S.RADHIKA ,Assistant. Professor</b>	

ASSIGNMENTQUESTIONS(MID-I)

**ASSIGNMET-I**

Batch. No	Assignment Questions	Roll Number	Course outcome	Level
1.	1. Define algorithm. Explain the characteristics of the algorithm (remembering) 2. Explain Merge sort algorithm using divide and conquer method (understanding) 3. Write and explain the UNION algorithm using weighted rule with an example. 4. Solve sum of subsets problem and write algorithm 5. Explain Strassen's Matrix multiplication with example.	22D41A1201	CO1	1
		To	CO1	2
		22D41A1205	CO2	2
			CO2	6
			CO3	4
2.	1. What is Performance analysis? Define different time complexity notations 2. Analyze time complexity of quick sort? 3. Compare find and collapsing find Algorithms with example 4. Design an algorithm to solve N queen's problem 5. Explain the general method of Dynamic programming	22D41A1206	CO1	1
		To	CO1	4
			CO2	6
		22D41A1210	CO2	6
			CO3	5
3.	1. Explain the general method of Dynamic programming 2. Find Big-oh notation and Little-oh notation for $f(n) = 7n^3 + 50n^2 + 200$ 3. What is Performance analysis? Define different time complexity notations 4. Explain General method of back tracking 5. Explain the general method of Dynamic programming	22D41A1211	CO3	4
		To	CO1	1
			CO1	1
		22D41A1215	CO2	4
			CO3	4

4.	1.What is binary search 2.What is Performance analysis? Define different time complexity notations 3. Design an algorithm to solve N queen’s problem 4.Explain the usefulness of the following fundamental operations on sets (a) FIND (b) UNION 5.Explain Strassen’s Matrix multiplication with example.	22D41A1216 To 22D41A1220	CO1 CO1 CO2 CO3 CO3	1 1 6 4 4
5.	1.What do you mean by performance analysis of an algorithm? Explain 2.Explain Binary search algorithm with an example 3.Explain Disjoint set operations 4.Solve sum of subsets problem and write algorithm 5.Implement Optimal binary search trees with dynamic programming	22D41A1221 To 22D41A1225	CO1 CO3 CO2 CO2 CO3	1 4 4 6 6
6.	1.Explain how quick sort sorts the following sequences of keys in ascending order. 22,55,33,11,99,77,55,66,54,21,32 2.Compute time complexity of Merge sort 3.Explain General method of back tracking 4.Determine weighted union and collapsing find algorithm with an Example 5.Explain the general method of Dynamic programming	22D41A1226 To 22D41A1230	CO1 CO1 CO2 CO2 CO3	4 6 4 5 4
7.	1.Given $f(n)=20n^3 - 3$ , then prove that $f(n)=O(n^3)$ .? 2.What is sorting? 3.Write and explain the find algorithm 4.Write Algorithm for graph coloring problem 5.Design optimal binary search tree algorithm with an example	22D41A1231 To 22D41A1235	CO1 CO2 CO3 CO2 CO3	6 1 1 1 6

8.	<p>1. Define Divide and Conquer Method.</p> <p>2. Define algorithm. Explain the characteristics of the algorithm</p> <p>3. Determine weighted union and collapsing find algorithm with an Example</p> <p>4. Write Algorithm for graph coloring problem</p> <p>5. Implement Optimal binary search trees with dynamic programming.</p>	<p>22D41A1236</p> <p>To</p> <p>22D41A1240</p>	<p>CO1</p> <p>CO1</p> <p>CO3</p> <p>CO2</p> <p>CO3</p>	<p>1</p> <p>1</p> <p>5</p> <p>1</p> <p>6</p>
9.	<p>1. Implement Optimal binary search trees with dynamic programming</p> <p>2. Solve sum of subsets problem and write algorithm</p> <p>3. Write and explain the UNION algorithm using weighted rule with an example</p> <p>4. Define Divide and Conquer Method</p> <p>5. What do you mean by performance analysis of an algorithm? Explain</p>	<p>22D41A1241</p> <p>To</p> <p>22D41A1245</p>	<p>CO3</p> <p>CO2</p> <p>CO2</p> <p>CO1</p> <p>CO1</p>	<p>6</p> <p>6</p> <p>1</p> <p>1</p> <p>1</p>
10.	<p>1. What is Performance analysis? Define different time complexity notations</p> <p>2. Compute time complexity of Merge sort</p> <p>3. Define union and find algorithm with an Example</p> <p>4. Explain General method of back tracking</p> <p>5. Implement Optimal binary search trees with dynamic programming</p>	<p>22D41A1246</p> <p>To</p> <p>22D41A1250</p>	<p>CO1</p> <p>CO1</p> <p>CO2</p> <p>CO2</p> <p>CO3</p>	<p>1</p> <p>5</p> <p>1</p> <p>4</p> <p>6</p>
11.	<p>1. Explain how quick sort sorts the following sequences of keys in ascending order. 22,55,33,11,99,77,55,66,54,21,32</p> <p>2. What is Performance analysis? Define different time complexity notations</p> <p>3. Implement Optimal binary search trees with dynamic programming</p> <p>4. Design an algorithm to solve N queen's problem</p> <p>5. Define Divide and Conquer Method</p>	<p>22D41A1251</p> <p>To</p> <p>22D41A1255</p>	<p>CO1</p> <p>CO1</p> <p>CO3</p> <p>CO2</p> <p>CO1</p>	<p>4</p> <p>1</p> <p>6</p> <p>3</p> <p>1</p>

12.	1. Define Divide and Conquer Method 2. Explain Binary search algorithm with an example 3. What is general method of back tracking? Explain N queen problem 4. Define graph coloring? Write algorithm for graph coloring problem using backtracking 5. Explain the general method of Dynamic programming.	22D41A1256  To 22D41A1260	CO1 CO1 CO2  CO2  CO3	2 1 2  1  2
13.	1. Explain the general method of Dynamic programming 2. Write and explain the UNION algorithm using weighted rule with an example 3. Solve sum of subsets problem and write algorithm 4. Analyze time complexity of quick sort 5. Define algorithm. Explain the characteristics of the algorithm	22D41A1261 To  LE-3	CO3  CO2 CO2  CO1  CO1	4  2 3  6  2
14.	1. Find Big-oh notation and Little-oh notation for $f(n) = 7n^3 + 50n^2 + 200$ 2. Define algorithm. Explain the characteristics of the algorithm 3. Explain Disjoint set operations 4. Define graph coloring? Write algorithm for graph coloring problem using backtracking 5. Design optimal binary search tree algorithm with an example	LE4  To  LE6	CO1  CO1 CO3  CO2  CO3	4  6 4  1  3

## ASSIGNMENT-II

Batch. No	Assignment Questions	Roll Number	Course outcome	Level
1.	<p>1. What is the significance of 0/1 knapsack problem? how can you solve it</p> <p>2. Explain General Method of Greedy Approach</p> <p>3. Explain Job sequencing algorithm with an example</p> <p>4. Explain General method of Branch and Bound.</p> <p>5. Solve the Travelling Sales person Problem with an example.</p>	<p>22D41A1201 to 22D41A1205</p>	<p>CO4</p> <p>CO5</p> <p>CO5</p> <p>CO6</p> <p>CO6</p>	<p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>6</p>
2.	<p>1. Evaluate Travelling sales person problem (TSP) problem with an Example</p> <p>2. Discuss Advantages and Disadvantages of Dynamic Programming</p> <p>3. Solve the following problem of Job sequencing with the dead line specified using Greedy strategy. N=4, (p1, p2, p3, p4) = (100, 10, 15, 27) (d1, d2, d3, d4) = (2, 1, 2, and 1).</p> <p>4. Describe LC Branch and Bound Solution</p> <p>5. Explain branch and bound method to solve 0/1 knapsack problem</p>	<p>22D41A1206 to 22D41A1210</p>	<p>CO4</p> <p>CO4</p> <p>CO5</p> <p>CO6</p> <p>CO6</p>	<p>5</p> <p>2</p> <p>6</p> <p>3</p> <p>2</p>
3.	<p>1. Differentiate Prim's and Kruskal's Algorithms</p> <p>2. Describe the following Feasible solution            b) optimal solution</p> <p>3. Explain Optimization problem.</p> <p>4. Explain maximum Clique.</p> <p>5. What is reliability design problem? How can you solve it.</p>	<p>22D41A1211 to 22D41A1215</p>	<p>CO5</p> <p>CO5</p> <p>CO6</p> <p>CO6</p> <p>CO4</p>	<p>4</p> <p>3</p> <p>2</p> <p>2</p> <p>1</p>

4.	<p>1. What is All Pairs Shortest Path (APSP) problem? Write Algorithm to solve it</p> <p>2. What is reliability design problem? How can you solve it.</p> <p>3. Find the optimal solution for the given instance of knapsack problem. <math>n=7, m=15</math>,  <math>(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 8, 3)</math>  <math>(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)</math>  Find the optimal solution for  a. Maximum profit.    b. Minimum weight.</p> <p>4. Evaluate the steps in Kruskal's Algorithm</p> <p>5. Distinguish NP-Hard and NP Complete classes</p>	<p>22D41A1216 to 22D41A1220</p>	<p>CO4 CO4 CO5 CO5 CO6</p>	<p>1 1 5 5 4</p>
5.	<p>1. Explain Prim's Algorithm</p> <p>2. Write an Algorithm for greedy Method</p> <p>3. Distinguish between Deterministic and non-deterministic algorithm</p> <p>4. Discuss Advantages and Disadvantages of Dynamic Programming</p> <p>5. Explain Cook's Theorem with example</p>	<p>22D41A1221 to 22D41A1225</p>	<p>CO5 CO5 CO6 CO4 CO6</p>	<p>2 1 3 2 2</p>
6.	<p>1. What is the significance of 0/1 knapsack problem? how can you solve it</p> <p>2. Explain minimum cost spanning tree.</p> <p>3. Show the step by step procedure of deriving the minimum cost spanning tree using Kruskal's algorithm.</p> <p>4. Explain Prim's Algorithm</p> <p>5. Describe the following  a) Minimum cost spanning tree</p> <p>Single source shortest path Problem</p>	<p>22D41A1226 to 22D41A1230</p>	<p>CO4 CO5 CO5 CO5 CO5</p>	<p>1 3 4 2 3</p>
7.	<p>1. Find the optimal solution for the given instance of knapsack problem. <math>n=7, m=15</math>,  <math>(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 8, 3)</math>  <math>(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)</math>  Find the optimal solution for  a. Maximum profit.    b. Minimum weight.</p> <p>2. Explain Prim's Algorithm</p> <p>3. Explain General Method of Greedy Approach</p> <p>4. Explain the P, NP, NP-Hard and NP-complete classes? Give relationship between them?</p> <p>5. Explain Maximum Program stored problem</p>	<p>22D41A1231 to 22D41A1235</p>	<p>CO5 CO5 CO5 CO6 CO6</p>	<p>5 5 2 2 2</p>
8.	<p>1. Solve the Travelling Sales person Problem with an example.</p> <p>2. Describe LC Branch and Bound Solution</p> <p>3. Explain Prim's Algorithm</p> <p>4. Discuss Advantages and Disadvantages of Dynamic Programming</p> <p>5. What is the significance of 0/1 knapsack problem? how can you solve it</p>	<p>22D41A1236 to 22D41A1240</p>	<p>CO6 CO6 CO5 CO5 CO4</p>	<p>6 3 2 2 1</p>

9.	<p>1. What is reliability? How to design reliability</p> <p>2. Write and explain Algorithm for Optimal Binary Search Tree (OBST)</p> <p>3. Find the optimal solution for the given instance of knapsack problem. <math>n=7, m=15,</math>  <math>(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 8, 3)</math>  <math>(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)</math>  Find the optimal solution for  a. Maximum profit. b. Minimum weight.</p> <p>4. Explain Prim's Algorithm</p> <p>5. Explain maximum Clique.</p>	22D41A1241 to 22D41A1245	CO5 CO4 CO5 CO5 CO6	1 2 5 2 2
10.	<p>1. Discuss Advantages and Disadvantages of Dynamic Programming</p> <p>2. Solve the following problem of Job sequencing with the dead line specified using Greedy strategy.  <math>N=4, (p_1, p_2, p_3, p_4) = (100, 10, 15, 27)</math>  <math>(d_1, d_2, d_3, d_4) = (2, 1, 2, \text{and } 1).</math></p> <p>3. What is the Significance of 0/1 knapsack problem? how can you solve it</p> <p>4. Explain General method of backtracking</p> <p>5. Solve the Travelling Sales person Problem with an example.</p>	22D41A1246 to 22D41A1250	CO4 CO5 CO4 CO6 CO6	2 6 1 2 6
11.	<p>1. Distinguish NP-Hard and NP Complete classes</p> <p>2. Evaluate Travelling sales person problem (TSP) problem with an Example</p> <p>3. Distinguish between Deterministic and non-deterministic algorithm</p> <p>4. Solve the following problem of Job sequencing with the dead line specified using Greedy strategy.  <math>N=4, (p_1, p_2, p_3, p_4) = (100, 10, 15, 27)</math>  <math>(d_1, d_2, d_3, d_4) = (2, 1, 2, \text{and } 1).</math></p> <p>5. Evaluate Single source shortest path problem with Example</p>	22D41A1251 to 22D41A1255	CO6 CO4 CO6 CO5 CO5	4 5 4 6 5
12.	<p>1. What is reliability? How to design reliability</p> <p>2. Discuss Advantages and Disadvantages of Dynamic Programming</p> <p>3. Distinguish NP-Hard and NP Complete classes</p> <p>4. Distinguish between Deterministic and non-deterministic algorithm</p> <p>5. Solve the following problem of Job sequencing with the dead line specified using Greedy strategy.  <math>N=4, (p_1, p_2, p_3, p_4) = (100, 10, 15, 27)</math>  <math>(d_1, d_2, d_3, d_4) = (2, 1, 2, \text{and } 1).</math></p>	22D41A1256 to 22D41A1260	CO5 CO4 CO6 CO5 CO5	1 2 4 6 6
13.	<p>1. What is the Significance of 0/1 knapsack problem? how can you solve it</p> <p>2. Explain minimum cost spanning tree.</p> <p>3. Distinguish between Deterministic and non-deterministic algorithm</p> <p>4. Explain General method of back tracking</p> <p>5. Solve the Travelling Sales person Problem with an example.</p>	22D41A1261 to LE-3	CO4 CO5 CO5 CO6	1 3 6 2 1

14.	<ol style="list-style-type: none"> <li>1. Explain Prim's Algorithm</li> <li>2. What is reliability? How to design reliability</li> <li>3. Distinguish NP-Hard and NP Complete classes</li> <li>4. Write Algorithm for greedy Method</li> <li>5. Solve the Travelling Sales person Problem with an example.</li> </ol>	LE4 to LE6	CO5  CO5  CO5  CO5  CO6	2 1 5 1 6
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<b>SRI INDU COLLEGE OF ENGINEERING &amp; TECHNOLOGY</b> <b>Question Bank</b> <b>(Regulation: R22)</b> <b>Department of IT</b>		<b>Regulation: R22</b>
<b>Sub. Code &amp; Title</b>	<b>R22INF3212 – Algorithm Design and Analysis</b>	
<b>Academic Year: 2024-25</b>	<b>Year/Sem./Section</b>	<b>III/II/A</b>
<b>Faculty Name &amp; Designation</b>	<b>Mrs.J.S.Radhika, ASST.PROFESSOR</b>	

**QUESTIONBANKWITHBLOMSTAXONOMYLEVEL(BTL)**

(1.Remembering2.Understanding3.Applying4.Analyzing5.Evaluating6.Creating)

<b>UNIT –I</b> <b>INTRODUCTION TO ALGORITHM</b>			
SL.NO	MultiplechoiceQuestions	BT Level	Course Outcome
1C - 1	Which of the following best describes space complexity? A) The amount of time taken by an algorithm to run B) The amount of memory required by an algorithm to run C) The number of steps an algorithm takes to complete D) The size of the input to the algorithm	<b>I</b>	<b>CO1</b>
1C - 2	If an algorithm requires a fixed amount of memory regardless of the input size, its space complexity is: A) O (1)                      B) O(n) C) O(log n)                  D) O(n^2)	<b>III</b>	<b>CO1</b>
1C - 3	Which of the following is the Big-O notation for linear time complexity? A) O(1) B) O(log n)                                      C) O(n)      D) O(n^2)	<b>I</b>	<b>CO1</b>
1C - 4	Omega notation ( $\Omega$ ) provides a lower bound for the time complexity of an algorithm. Which case does it describe? A) Best-case scenario B) Worst-case scenario C) Average-case scenario D) Amortized-case scenario	<b>I</b>	<b>CO1</b>
1C - 5	What is the time complexity of the binary search algorithm? A) O(n) B) O (n log n) C) O (log n) D) O (1)	<b>I</b>	<b>CO1</b>
1C - 6	In binary search, the array must be: A) Unsorted B) Sorted in descending order C) Sorted in ascending order D) Partially sorted	<b>I</b>	<b>CO1</b>
1C - 7	What is the worst-case time complexity of Quick Sort? A) O(n) B) O (n log n)	<b>I</b>	<b>CO1</b>

	C) $O(n^2)$ D) $O(\log n)$		
1C - 8	Merge Sort uses which of the following approaches? A) Greedy algorithm B) Divide and conquer C) Dynamic programming D) Backtracking	<b>II</b>	<b>CO1</b>
1C - 9	What is the time complexity of Merge Sort in the worst case? A) $O(n)$ B) $O(n \log n)$ C) $O(n^2)$ D) $O(\log n)$	<b>I</b>	<b>CO1</b>
1C - 10	Strassen's algorithm is used for: A) Searching in an array B) Sorting a list of numbers C) Matrix multiplication D) Finding shortest paths in a graph	<b>II</b>	<b>CO1</b>
1C - 11	What is the time complexity of Strassen's matrix multiplication algorithm? A) $O(n^2)$ B) $O(n^3)$ C) $O(n^{2.81})$ D) $O(n \log n)$	<b>I</b>	<b>CO1</b>
1C - 12	In binary search, the array must be: A) Unsorted B) Sorted in descending order C) Sorted in ascending order D) Partially sorted	<b>I</b>	<b>CO1</b>
1C - 13	Which of the following is not a step in the divide and conquer approach? A) Divide the problem into subproblems B) Conquer the subproblems by solving them independently C) Combine the solutions of the subproblems D) Iterate over the entire problem without dividing	<b>I</b>	<b>CO1</b>
1C - 14	Theta notation ( $\Theta$ ) provides: A) An upper bound on time complexity B) A lower bound on time complexity C) Both an upper and a lower bound on time complexity D) Neither an upper nor a lower bound on time complexity	<b>I</b>	<b>CO1</b>
1C - 15	An algorithm has a time complexity of $O(n^2)$ . What happens to the running time if the input size is doubled? A) It remains the same B) It doubles C) It quadruples D) It increases logarithmically	<b>II</b>	<b>CO1</b>

**FillintheBlanks**

1F - 1	The _____ complexity of an algorithm refers to the amount of memory required by the algorithm to run to completion	<b>I</b>	<b>CO1</b>
1F - 2	An algorithm with space complexity $O(1)$ requires a _____ amount of memory regardless of the input size	<b>II</b>	<b>CO1</b>
1F - 3	The _____ complexity of an algorithm describes the amount of time taken by the algorithm as a	<b>I</b>	<b>CO1</b>

	function of the input size		
1F – 4	If an algorithm's running time is $O(n^2)$ , doubling the input size will cause the running time to _____.	<b>III</b>	<b>CO1</b>
1F – 5	Big-O notation is used to describe the _____-case time complexity of an algorithm	<b>I</b>	<b>CO1</b>
1F – 6	An algorithm with time complexity $O(n)$ is said to have _____ time complexity	<b>I</b>	<b>CO1</b>
1F – 7	Omega ( $\Omega$ ) notation provides a _____ bound for the time complexity of an algorithm.	<b>I</b>	<b>CO1</b>
1F – 8	If an algorithm has time complexity $\Omega(n)$ , it means the algorithm will take at least _____ steps to complete	<b>I</b>	<b>CO1</b>
1F – 9	Omega ( $\Omega$ ) notation provides a _____ bound for the time complexity of an algorithm	<b>I</b>	<b>CO1</b>
1F – 10	For an algorithm with time complexity $\Theta(n \log n)$ , the running time is bounded both above and below by _____.	<b>II</b>	<b>CO1</b>
1F – 11	The first step in the divide and conquer approach is to _____ the problem into smaller sub problems	<b>I</b>	<b>CO1</b>
1F – 12	A key step in the Quick Sort algorithm is finding the _____ element and partitioning the array.	<b>I</b>	<b>CO1</b>
1F – 13	The time complexity of binary search is _____.	<b>I</b>	<b>CO1</b>
1F – 14	Merge Sort follows the _____ and conquer approach	<b>I</b>	<b>CO1</b>
1F – 15	<u>Strassen's algorithm is used for _____ multiplication.</u>	<b>V</b>	<b>CO1</b>

### Match the Following

1M-1	<ol style="list-style-type: none"> <li>1. Space Complexity</li> <li>2. Time Complexity</li> <li>3. <math>O(1)</math></li> <li>4. <math>O(n^2)</math></li> <li>5. <math>O(\log n)</math></li> </ol>	<ol style="list-style-type: none"> <li>a. Constant time complexity</li> <li>b. The amount of memory required by an algorithm</li> <li>c. The amount of time taken by an algorithm as a function of the input size</li> <li>d. Linear time complexity</li> <li>e. Quadratic time complexity</li> </ol>	<b>III</b>	<b>CO1</b>
1M-2	<ol style="list-style-type: none"> <li>1. Big-O Notation</li> <li>2. Omega (<math>\Omega</math>) Notation</li> <li>3. Theta (<math>\Theta</math>) Notation</li> <li>4. Little-o (<math>o</math>) Notation</li> </ol>	<ol style="list-style-type: none"> <li>a. Describes an upper bound on time complexity</li> <li>b. Describes a lower bound on time complexity</li> <li>c. Describes both upper and lower bounds on time complexity</li> <li>d. Describes a strict upper bound on time complexity</li> </ol>	<b>III</b>	<b>CO1</b>
1M-3	<ol style="list-style-type: none"> <li>1. Binary Search</li> <li>2. Quick Sort</li> <li>3. Merge Sort</li> <li>4. Strassen's Matrix Multiplication</li> </ol>	<ol style="list-style-type: none"> <li>a. Finding an element in a sorted array</li> <li>b. Sorting an array with pivot selection and partitioning</li> <li>c. Matrix multiplication with fewer multiplications than traditional methods</li> <li>d. Sorting an array by dividing, sorting, and merging</li> </ol>	<b>I</b>	<b>CO1</b>
1M-4	<ol style="list-style-type: none"> <li>1. Divide</li> <li>2. Conquer</li> <li>3. Combine</li> <li>4. <math>T(P)</math></li> </ol>	<ol style="list-style-type: none"> <li>a. Solve the sub problems independently</li> <li>b. Merge the solutions of the sub problems</li> <li>c. Split the problem into smaller subproblems</li> <li>d. Time complexity</li> </ol>	<b>I</b>	<b>CO1</b>
1M – 5	<ol style="list-style-type: none"> <li>1. linear time</li> <li>2. Constant time</li> <li>3. logarithmic time</li> <li>4. time Complexity</li> </ol>	<ol style="list-style-type: none"> <li>a. <math>O(\log n)</math></li> <li>b. <math>O(n)</math></li> <li>c. <math>O(1)</math></li> <li>d. <math>T(P)</math></li> </ol>	<b>II</b>	<b>CO1</b>

### 5 – MARKS QUESTIONS

1D – 1	What do you mean by performance analysis of an algorithm? Explain	<b>I</b>	<b>CO1</b>
1D – 2	Define algorithm. Explain the characteristics of the algorithm	<b>I</b>	<b>CO1</b>
1D – 3	Find Big-oh notation and Little-oh notation for $f(n) = 7n^3 + 50n^2 + 200$ .	<b>V</b>	<b>CO1</b>

1D – 4	What is Performance analysis? Define different time complexity notations.	I	CO1
1D – 5	Given $f(n)=20n^3-3$ , then prove that $f(n)=O(n^3)$ ?	V	CO1
1D – 6	Explain Binary search algorithm with an example?	II	CO1
1D – 7	Develop general method for Divide and Conquer approach?	VI	CO1
1D – 8	Explain Merge sort algorithm using divide and conquer method.	II	CO1
1D – 9	Explain Strassen's Matrix multiplication with example.	II	CO1
1D – 10	Explain how quick sort sorts the following sequences of keys in ascending order. 22,55,33,11,99,77,55,66,54,21,32	II	CO1
1D – 11	Define Divide and Conquer Method?	I	CO1
1D – 12	What is binary search ?	I	CO1
1D – 13	What is sorting?	I	CO1
1D – 14	Analyze time complexity of quick sort?	IV	CO1
1D – 15	Compute time complexity of Merge sort.	III	CO1

**UNIT – II**  
**DISJOINT SETS**

SL.NO	Multiple choice Questions	BT Level	Course Outcome
2C - 1	Which of the following data structures is used to implement the Disjoint Set operations? A) Linked List B) Binary Tree C) Hash Table D) Union-Find Structure	I	CO2
2C - 2	What is the primary purpose of the Union-Find algorithm? A) To sort a list of elements B) To find the shortest path in a graph C) To determine which subset a particular element is in D) To balance a binary search tree	I	CO2
2C - 3	What is the time complexity of the Find operation in the Union-Find algorithm with path compression? A) $O(1)$ B) $O(\log n)$ C) $O(n)$ D) $O(\alpha(n))$ , where $\alpha(n)$ is the inverse Ackermann function	I	CO2
2C - 4	In the Union-Find algorithm, what is the purpose of the Union by Rank technique? A) To keep track of the number of elements in each set B) To ensure that the tree remains balanced C) To perform path compression efficiently D) To find the root of the tree quickly	II	CO2
2C - 5	Which of the following operations is not a part of the basic operations of the Union-Find structure? A) Find B) Union C) Insert D) Make Set	I	CO2
2C - 6	Which of the following problems can be solved using the backtracking technique? A) Sorting a list of numbers B) Solving a system of linear equations C) N-Queen's problem D) Calculating the greatest common divisor	II	CO2
2C - 7	Which backtracking technique is used to eliminate the need to explore all possible solutions? A) Branch and Bound	I	CO2

	<p>B) Greedy Method  C) Dynamic Programming  D) Divide and Conquer</p>		
2C - 8	<p>In graph coloring, what is the objective?  A) To find the shortest path between two nodes  B) To determine if a graph is bipartite  C) To color the vertices of a graph such that no two adjacent vertices have the same color  D) To find the minimum spanning tree</p>	I	CO2
2C - 9	<p>Which of the following is an example of a constraint satisfaction problem that can be solved using backtracking?  A) Matrix multiplication  B) Graph traversal  C) Sum of subsets problem  D) Fibonacci sequence calculation</p>	I	CO2
2C - 9	<p>Which of the following is an example of a constraint satisfaction problem that can be solved using backtracking?  A) Matrix multiplication  B) Graph traversal  C) Sum of subsets problem  D) Fibonacci sequence calculation</p>	I	CO2
2C - 10	<p>In the N-Queen's problem, what is the goal?  A) To place N queens on a chessboard such that no two queens attack each other  B) To find the shortest path for a knight to visit all squares  C) To place N rooks on a chessboard such that no two rooks attack each other  D) To solve a Sudoku puzzle</p>	III	CO2
2C - 11	<p>What is the worst-case time complexity of the naive Union operation in a Disjoint Set data structure?  A) <math>O(1)</math>  B) <math>O(\log n)</math>  C) <math>O(n)</math>  D) <math>O(n^2)</math></p>	I	CO2
2C - 12	<p>Which of the following sequences of operations on Disjoint Sets is most efficient when combined with path compression?  A) Multiple find operations followed by a single union operation  B) Multiple union operations followed by a single find operation  C) Alternating find and union operations  D) None of the above</p>	I	CO2
2C - 13	<p>In the context of Disjoint Sets, what does the term "rank" refer to?  A) The size of the set  B) The depth of the tree representing the set  C) The number of elements in the set  D) The identifier of the set</p>	II	CO2
2C - 14	<p>Which of the following is true about the Union-Find data structure with both path compression and union by rank?  A) The amortized time complexity of each operation is <math>O(\log n)</math>  B) The amortized time complexity of each operation is <math>O(n)</math>  C) The amortized time complexity of each operation is <math>O(1)</math>  D) The amortized time complexity of each operation is <math>O(\alpha(n))</math></p>	II	CO2

2C - 15	In the Union-Find algorithm, what does path compression achieve? A) It reduces the height of the trees B) It merges two sets into one C) It finds the representative of a set D) It keeps track of the size of each set	II	CO2	
<b>FILL IN THE BLANKS</b>				
2F - 1	The _____ operation in the Union-Find algorithm is used to merge two subsets into a single subset.	I	CO2	
2F - 2	The technique used to keep the tree flat in the Union-Find algorithm is known as _____.	II	CO2	
2F - 3	The _____ operation is used to determine the root or representative of the subset to which a particular element belongs.	I	CO2	
2F - 4	In the Union-Find algorithm, Union by _____ is used to keep the tree balanced.	I	CO2	
2F - 5	The Union-Find data structure is also known as the _____ data structure.	I	CO2	
2F - 6	The Union-Find algorithm is commonly used in _____ algorithms to detect cycles.	II	CO2	
2F - 7	The amortized time complexity of the Find operation with path compression is _____.	I	CO2	
2F - 8	In the N-Queen's problem, the objective is to place _____ queens on an n x n chessboard such that no two queens threaten each other.	I	CO2	
2F - 9	The backtracking technique involves constructing a solution _____ by _____.	I	CO2	
2F - 10	A problem that can be solved using backtracking typically allows for _____ construction of a solution.	I	CO2	
2F - 11	The sum of subsets problem aims to find a subset of numbers that adds up to a given _____.	I	CO2	
2F - 12	In graph coloring, the objective is to color the vertices of a graph such that no two _____ vertices have the same color.	III	CO2	
2F - 13	The minimum number of colors needed to color a graph is called the _____ number	I	CO2	
2F - 14	The backtracking technique can be applied to solve the _____ Path Problem in graph theory.	III	CO2	
2F - 15	In the context of backtracking, a _____ search is often used to explore all possible solutions.	I	CO2	
<b>MATCH THE FOLLOWING</b>				
2M - 1	1. Union 2. Find 3. Path Compression 4. Union by Rank	A. Used to determine the root or representative of a set B. Merges two subsets into a single subset C. Ensures that the tree representing the set remains balanced D. Keeps the tree flat and reduces the time complexity of Find operation	II	CO2
2M - 2	1. MakeSet 2. Disjoint Set 3. Inverse Ackermann Function 4. n queen problem	A. Initializes each element in its own set B. Data structure that supports union and find operations C. Used to express the amortized time complexity of union-find D. Back tracking	I	CO2
2M - 3	1. Sum of Subsets 2. Graph Coloring 3. Chromatic Number 4. Hamiltonian Path Problem	A. the minimum no. of colors required. B. back tracking C. Used to explore all possible solutions and backtrack when a partial solution violates constraints D. Objective is to color the vertices of a graph such that no two adjacent vertices have the same color	III	CO2
2M - 4	1. Union-Find Structure 2. Connected Components	A. The process of combining two sets into one B. Determines if two elements are in the same subset	IV	CO2

	3. Union Operation 4. Find Operation	C. Subsets in which any two vertices are connected by paths D. A collection of trees representing disjoint sets		
2M - 5	1. Constraint Satisfaction 2. Branch and Bound 3. Incremental Approach 4. Graph Coloring Problem	A. Problems where a solution must meet a number of constraints B. Problem of coloring a graph such that no two adjacent vertices share the same color C. Strategy that builds solutions piece by piece, ensuring each piece is valid before proceeding D. Search strategy that systematically explores all branches, using bounds to prune branches	III	CO2

**5 – MARKS QUESTIONS**

2D - 1	Explain the usefulness of the following fundamental operations onsets (a) FIND (b) UNION		II	CO2
2D - 2	Determine weighted union and collapsing find algorithm With an Example.		V	CO2
2D - 3	Write Algorithm for graph coloring problem		I	CO2
2D - 4	What is general method of back tracking? Explain N queen problem		I	CO2
2D - 5	Explain Sum of subset problem with example .		II	CO2
2D - 6	Two sets S1 and S2 are given as below S1= {1,2,4,6} and S2= {7,8} (a) Draw Disjoint sets S1 and S2 using Trees. (b) Draw Disjoint sets S3 such that S3=S1US2 Draw Disjoint sets S4 such that S4=S2US1		IV	CO2
2D - 7	Write and explain the find algorithm using collapse rule with an example.		II	CO2
2D - 8	Write and explain the UNION algorithm using weighted rule with an example.		II	CO2
2D - 9	Explain Disjoint set operations.		II	CO2
2D - 10	Compare union and weighted union Algorithms with example. .		IV	CO2
2D - 11	Explain General method of back tracking		II	CO2
2D - 12	Design an algorithm to solve N queen's problem		VI	CO2
2D - 13	Solve sum of subsets problem and write algorithm.		III	CO2
2D - 14	Define chromatic number? Write algorithm for graph coloring problem using backtracking		I	CO2
2D - 15	Compare find and collapsing find Algorithms with example.		IV	CO2

**UNIT – III  
DYNAMIC PROGRAMMING**

**Multiple choice Questions**

SL.NO		BT Level	Course Outcome
3C - 1	What is the primary approach used in dynamic programming to solve problems? A) Greedy Method B) Divide and Conquer C) Breaking problems into simpler sub problems and storing solutions D) Brute Force	I	CO3
3C - 2	Which of the following is NOT a characteristic of problems suitable for dynamic programming?	II	CO3

	<p>A) Overlapping Sub problems  B) Optimal Substructure  C) Independent Sub problems  D) Memorization</p>		
3C - 3	<p>In the context of dynamic programming, what is memoization?  A) A technique to divide the problem into independent sub problems  B) A method to store the results of expensive function calls and reuse them  C) A strategy to sort elements in a list  D) A process to merge sorted arrays</p>	<b>I</b>	<b>CO3</b>
3C - 4	<p>Which algorithm is commonly used to solve the all pairs shortest path problem?  A) Bellman-Ford Algorithm  B) Dijkstra's Algorithm  C) Floyd-Warshall Algorithm  D) Prim's Algorithm</p>	<b>I</b>	<b>CO3</b>
3C - 5	<p>In the 0/1 knapsack problem, what does the "0/1" signify?  A) Each item can be taken any number of times  B) Each item can be either taken completely or not taken at all  C) Each item has a binary weight  D) Each item has a binary value</p>	<b>II</b>	<b>CO3</b>
3C - 6	<p>What is the main goal of the traveling salesperson problem (TSP)?  A) To visit each city exactly once and return to the starting city with the minimum distance traveled  B) To find the shortest path between two cities  C) To color the cities so that no two adjacent cities have the same color  D) To maximize the number of cities visited</p>	<b>I</b>	<b>CO3</b>
3C - 7	<p>Which of the following is a key objective in reliability design using dynamic programming?  A) Minimizing the total cost  B) Maximizing the reliability of a system  C) Finding the shortest path in a network  D) Sorting elements in ascending order</p>	<b>I</b>	<b>CO3</b>
3C - 8	<p>In an optimal binary search tree, what is the primary criterion for determining the tree structure?  A) Minimizing the height of the tree  B) Minimizing the expected search cost  C) Maximizing the number of nodes  D) Maximizing the balance factor</p>	<b>II</b>	<b>CO3</b>
3C - 9	<p>Which dynamic programming algorithm can be used to solve the single-source shortest path problem in a weighted graph with negative weights?  A) Dijkstra's Algorithm  B) Kruskal's Algorithm  C) Floyd-Warshall Algorithm  D) Bellman-Ford Algorithm</p>	<b>I</b>	<b>CO4</b>
3C - 10	<p>In dynamic programming, which property allows an optimal solution to be constructed efficiently from optimal solutions to its sub problems?  A) Greediness  B) Optimal substructure  C) Overlapping sub problems  D) Exponential complexity</p>	<b>I</b>	<b>CO4</b>
3C - 11	<p>Which of the following problems is NOT typically solved using dynamic programming?  A) Fibonacci sequence  B) Merge Sort  C) Longest Common Subsequence  D) Matrix Chain Multiplication</p>	<b>IV</b>	<b>CO4</b>

3C - 12	In the context of dynamic programming, what does the term "overlapping sub problems" mean? A) Sub problems that are completely independent B) Sub problems that share some common sub problems C) Sub problems that do not need to be solved multiple times D) Sub problems that are solved using a divide-and-conquer approach	I	CO4	
3C - 13	The 0/1 knapsack problem can be solved using dynamic programming by creating a table that stores the _____. A) Minimum weight of the items B) Maximum value obtainable with a given weight capacity C) Number of items selected D) Average value of the items	II	CO4	
3C - 14	In the Floyd-Warshall algorithm, the primary purpose is to find the _____. A) Longest path in a graph B) Minimum spanning tree of a graph C) Shortest paths between all pairs of vertices D) Maximum flow in a network	I	CO4	
3C - 15	Which of the following statements about dynamic programming is true? A) It is always more efficient than greedy algorithms B) It solves each subproblem only once and stores the result C) It cannot be applied to optimization problems D) It is the same as recursion	IV	CO4	
<b>FILL IN THE BLANKS</b>				
3F - 1	Dynamic programming solves problems by breaking them down into simpler _____ and storing their solutions	I	CO3	
3F - 2	The two key properties that a problem must have to be suitable for dynamic programming are optimal substructure and _____ sub problems.	IV	CO3	
3F - 3	The _____ technique in dynamic programming involves storing the results of expensive function calls and reusing them	I	CO3	
3F - 4	The _____ algorithm is used to solve the all pairs shortest path problem in a weighted graph	IV	CO3	
<b>MATCH THE FOLLOWING</b>				
3M - 1	1. Memorization 2. 0/1 Knapsack Problem 3. Optimal Substructure 4. Floyd-Warshall Algorithm	A. A dynamic programming algorithm used to solve the all pairs shortest path problem B. An optimal solution can be constructed from optimal Solutions of its subproblems C. Each item can be either taken completely or not taken at all D. Storing the results of expensive function calls and reusing them	I	CO3
3M - 2	1. Optimal Binary Search Trees 2. 0/1 knapsack problem 3. All pairs shortest problem 4. Travelling sales man Problem	A. Finding the most efficiency way search data B. Maximizing value with a weight constraint C. Determining the shortest paths between all pairs of Nodes D. Minimizing the total distance traveled to visit all cities once	I	CO3
3M - 3	1. Principle of optimality 2. spanning tree 3. prims algorithm 4. Dijkstra's Algorithm	A. solves SSSP problem B. Minimum cost spanning tree C. each subsequence must be optimal D. subset of a graph	II	CO3
3M - 4	1. Matrix Chain Multiplication 2. Optimal Binary Search Tree 3. Knapsack Table	A. Problem of finding the most reliable system configuration using components with given reliabilities B. Table used to store maximum values for given weights and items in the knapsack problem C. Minimizes the expected search cost in a binary search	I	CO4

	4. Reliability Design	D. Minimizes the number of scalar multiplications		
3M – 5	1. Optimal Binary Search Tree 2. Overlapping Sub problems 3. Bellman-Ford Algorithm 4. All Pairs Shortest Path	A. Finds the shortest paths between all pairs of vertices in a weighted graph B. Finds the shortest paths from a single source vertex to all other vertices in a graph C. Characteristic of problems where the same sub problems are Solved multiple times D. Minimizes the expected search cost in a binary search tree		CO4

### 5 – MARKS QUESTIONS

3D – 1	Explain the general method of Dynamic programming	II	CO3
3D – 2	Implement Optimal binary search trees with dynamic programming.	III	CO3
3D – 3	Write a function to compute lengths of shortest paths between all pairs of nodes for the given adjacency matrix. $\begin{pmatrix} 0 & 6 & 13 \\ 8 & 0 & 4 \\ 5 & \infty & 0 \end{pmatrix}$	II	CO3
3D – 4	Write a function to compute the total distance travelled by a sales person for the following $\begin{pmatrix} 0 & 10 \\ 15 & 2 & 0 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$	II	CO3
3D – 5	Evaluate 0/1 knapsack problem with dynamic programming	V	CO3
3D – 6	Design optimal binary search tree algorithm with an example.	VI	CO3
3D – 7	Explain All Pairs Shortest Problem and algorithm for solving it	II	CO3
3D – 8	What do you mean by Travelling sales person problem? How can you solve it	III	CO3
3D – 9	What is reliability? How to design reliability	I	CO4
3D – 10	Write and explain Algorithm for Optimal Binary Search Tree (OBST)	II	CO4
3D – 11	What is the Significance of 0/1 knapsack problem? how can you solve it	I	CO4
3D – 12	What is All Pairs Shortest Path (APSP) problem? Write Algorithm to solve it	I	CO4
3D – 13	What is reliability design problem? How can you solve it.	I	CO4
3D – 14	Evaluate Travelling sales person problem (TSP) problem with an Example	V	CO4
3D – 15	Discuss Advantages and Disadvantages of Dynamic Programming	II	CO4

### UNIT IV GREEDY METHOD

#### Multiple choice Questions

SL.NO		BT Level	Course Outcome
4C – 1	Which algorithm is commonly used to find the Minimum Cost Spanning Tree of a graph? A) Dijkstra's Algorithm B) Kruskal's Algorithm C) Bellman-Ford Algorithm D) Floyd-Warshall Algorithm	II	CO5
4C – 2	The Fractional Knapsack Problem differs from the 0/1 Knapsack Problem in that: A) Items cannot be divided or taken partially B) Items can be divided into fractions or partial quantities C) It does not use dynamic programming D) It does not involve weights and values	II	CO5
4C – 3	Which of the following algorithms is used to solve the Single Source Shortest Path Problem with non-negative weights? A) Kruskal's Algorithm B) Dijkstra's Algorithm C) Floyd-Warshall Algorithm D) Bellman-Ford Algorithm	I	CO5

4C – 4	In the context of the Greedy Method, which of the following problems can be solved using a greedy algorithm? A) The Traveling Salesperson Problem B) Job Sequencing with Deadlines C) Longest Common Subsequence D) Matrix Chain Multiplication	<b>I</b>	<b>CO5</b>
4C – 5	For which of the following problems is the greedy approach NOT typically used? A) Fractional Knapsack Problem B) Minimum Spanning Tree C) Job Sequencing with Deadlines D) Longest Path in a Graph	<b>I</b>	<b>CO5</b>
4C – 6	Which of the following statements about the Fractional Knapsack Problem is true? A) The problem does not allow fractional items B) The problem involves making choices that are not divisible C) The problem can be solved using a greedy approach by taking items with the highest value-to-weight ratio D) The problem is solved using dynamic programming	<b>I</b>	<b>CO5</b>
4C – 7	Which algorithm is used for finding the minimum spanning tree that grows one edge at a time by adding the smallest edge each time? A) Dijkstra’s Algorithm B) Prim’s Algorithm C) Bellman-Ford Algorithm D) Floyd-Warshall Algorithm	<b>I</b>	<b>CO5</b>
4C – 8	In the Single Source Shortest Path Problem, which algorithm is suitable for graphs with negative weights? A) Dijkstra’s Algorithm B) Kruskal’s Algorithm C) Bellman-Ford Algorithm D) Prim’s Algorithm	<b>II</b>	<b>CO5</b>
4C – 9	In the Job Sequencing Problem with deadlines, if two jobs have the same deadline, the job with the _____ should be scheduled first. A) Later start time B) Higher profit C) Shorter duration D) Longer duration	<b>I</b>	<b>CO5</b>
4C – 10	Which of the following algorithms is used to solve the Minimum Spanning Tree problem by growing the spanning tree from a starting vertex and adding the smallest weight edge at each step? A) Kruskal’s Algorithm B) Prim’s Algorithm C) Dijkstra’s Algorithm D) Bellman-Ford Algorithm	<b>I</b>	<b>CO5</b>
4C – 11	Which of the following is true about the greedy approach used for solving the Fractional Knapsack Problem? A) It is not applicable if items cannot be divided B) It solves the problem by taking items in order of their weight-to-value ratio C) It solves the problem by taking items in order of their value-to-weight ratio D) It involves using dynamic programming to solve the problem	<b>I</b>	<b>CO5</b>
4C – 12	The time complexity of Kruskal’s Algorithm for finding a minimum spanning tree, using a union-find data structure, is: A) $O(E \log E)$ B) $O(V^2)$ C) $O(E \log V)$	<b>I</b>	<b>CO5</b>

	D) $O(V \log V)$		
4C – 13	Which greedy algorithm is specifically designed to handle problems with fractional weights and values? A) Kruskal’s Algorithm B) Prim’s Algorithm C) Fractional Knapsack Algorithm D) Dijkstra’s Algorithm	<b>II</b>	<b>CO5</b>
4C – 14	The Single Source Shortest Path Problem using Dijkstra’s Algorithm requires that the graph has _____ weights. A) Negative B) Positive C) Zero D) Arbitrary	<b>II</b>	<b>CO5</b>
4C – 15	In the Job Sequencing Problem with deadlines, if two jobs have the same deadline, the job with the _____ should be scheduled first. A) Later start time B) Higher profit C) Shorter duration D) Longer duration	<b>I</b>	<b>CO5</b>
FILL IN THE BLANKS			
4F – 1	The _____ method solves problems by making the locally optimal choice at each step, with the hope of finding a global optimum	<b>I</b>	<b>CO5</b>
4F – 2	In the Job Sequencing Problem with deadlines, the goal is to maximize the number of jobs completed by their _____.	<b>I</b>	<b>CO5</b>
4F – 3	The _____ Knapsack Problem allows items to be divided into fractions or partial quantities, and is solved by taking items with the highest value-to-weight ratio first.	<b>II</b>	<b>CO5</b>
4F – 4	Kruskal’s Algorithm is used to find the _____ Spanning Tree of a graph by adding edges in increasing order of weight and avoiding cycles.	<b>II</b>	<b>CO5</b>
4F – 5	In the context of the Single Source Shortest Path Problem, Dijkstra’s Algorithm is used for graphs with _____ weights.	<b>I</b>	<b>CO5</b>
4F – 6	In the Job Sequencing Problem, if two jobs have the same deadline, the job with the _____ profit should be scheduled first	<b>II</b>	<b>CO5</b>
4F – 7	Prim’s Algorithm is a greedy algorithm used to find the Minimum Spanning Tree by expanding the tree from a starting _____ and adding the smallest edge each time	<b>II</b>	<b>CO5</b>
4F – 8	The _____ Knapsack Problem involves making decisions on a set of items to maximize the total value without exceeding a given weight capacity.	<b>I</b>	<b>CO5</b>
4F – 9	For the Minimum Spanning Tree problem, Kruskal’s Algorithm works by adding edges in increasing order of _____ and avoiding cycles.	<b>II</b>	<b>CO5</b>
4F – 10	The greedy approach for solving the Fractional Knapsack Problem involves taking items in order of their _____-to-weight ratio.	<b>V</b>	<b>CO5</b>
4F – 11	The time complexity of Dijkstra’s Algorithm, when using a priority queue, is _____.	<b>I</b>	<b>CO5</b>
4F – 12	The greedy method is often applied to problems where a _____ choice at each step leads to a globally optimal solution	<b>I</b>	<b>CO5</b>
4F – 13	In Kruskal’s Algorithm, edges are added to the Minimum Spanning Tree based on their _____, ensuring that no cycles are formed.	<b>I</b>	<b>CO5</b>
4F – 14	The _____ Knapsack Problem does not allow items to be divided and is solved using dynamic programming or a greedy approach.	<b>II</b>	<b>CO5</b>
4F – 15	In the Single Source Shortest Path Problem, the Dijkstra’s Algorithm finds the shortest path from a single source to all other _____ in the graph	<b>III</b>	<b>CO5</b>
MATCH THE FOLLOWING			

4M – 1	1.Greedy MethodA. Maximizes the number of jobs completed before their deadlines 2. Job Sequencing with DeadlinesB. Solves the knapsack problem where items can be divided into fractions or partial quantities 3.Fractional Knapsack ProblemC. Finds the minimum spanning tree by adding edges in increasing order of weight and avoiding cycles 4.Minimum Cost Spanning TreeD. Solves the problem by making the locally optimal choice at each step	<b>I</b>	<b>CO5</b>
4M – 2	1.Dijkstra’s Algorithm A. Solves the problem of finding the minimum spanningtree by adding the smallest edge each time 2.Kruskal’s Algorithm B. Finds the most valuable subset of items that can fit into a knapsack with a given capacity, without dividing items 3.Prim’s AlgorithmC. Technique used to solve the problem of finding the minimum spanning tree in a weighted graph 4. 0/1 Knapsack ProblemD. Solves the problem of finding the shortest path from a single source	<b>I</b>	<b>CO5</b>
4M - 3	1.Kruskal’s Algorithm A. A problem where items cannot be divided and must be taken or left entirely 2.0/1 Knapsack Problem B.A greedy algorithm that adds edges with the minimum weight and avoids cycles 3. Job Sequencing with Deadlines C.Solves the job sequencing problem by scheduling jobs with the highest profit first 4.Prim’s AlgorithmD.Solves the problem of finding a minimum spanning tree by expanding from a starting vertex	<b>II</b>	<b>CO5</b>
4M – 4	1.Feasible solution A. at each stage decision is made 2.Optimal function B. satisfies given constraints 3.Objective function C. maximize the value 4.Greedy method D. optimization measure	<b>II</b>	<b>CO5</b>
4M – 5	1.Knapsack problem A. Bag 2.Spanning tree B. collection of nodes connected by edges 3.Knapsack C. subset of graph 4. graph D. resources allocation	<b>III</b>	<b>CO5</b>
<b>5 – MARKS QUESTIONS</b>			
4D – 1	Explain General Method of Greedy Approach	<b>II</b>	<b>CO5</b>
4D – 2	Explain Job sequencing algorithm with an example	<b>II</b>	<b>CO5</b>
4D – 3	Solve the following problem of Job sequencing with the dead line specified using Greedy strategy. N=4, (p1, p2, p3, p4) = (100, 10, 15, 27) (d1, d2, d3, d4)= (2, 1, 2, and 1).	<b>VI</b>	<b>CO5</b>
4D – 4	Find the optimal solution for the given instance of knapsack problem. n=7, m=15, (p1, p2, p3, p4, p5, p6, p7) = (10, 5, 15, 7, 6, 8, 3) (w1, w2, w3, w4, w5, w6, w7) = (2, 3, 5, 7, 1, 4, 1) Find the optimal solution for a.Maximumprofit. b. Minimum weight.	<b>V</b>	<b>CO5</b>
4D – 5	Explain kruskal’s algorithm with an example	<b>II</b>	<b>CO5</b>
4D – 6	Explain minimum cost spanning tree.	<b>III</b>	<b>CO5</b>
4D – 7	Show the step by step procedure of deriving the minimum cost spanning tree using Kruskal’s algorithm.	<b>IV</b>	<b>CO5</b>
4D – 8	Evaluate Single source shortest path problem with Example	<b>V</b>	<b>CO5</b>
4D – 9	Describe the following a) Feasible solution b) optimal solution	<b>III</b>	<b>CO5</b>

4D – 10	Differentiate Prim's and Kruskal 's Algorithms	<b>IV</b>	<b>CO5</b>
4D – 11	Evaluate the steps in Kruskal's Algorithm	<b>V</b>	<b>CO5</b>
4D – 12	Explain Prim's Algorithm	<b>II</b>	<b>CO5</b>
4D – 13	Describe the concept of single source shortest path Problem	<b>III</b>	<b>CO5</b>
4D – 14	Describe the following a) Minimum cost spanning tree b) Single source shortest path Problem	<b>III</b>	<b>CO5</b>
4D – 15	Write Algorithm for greedy Method	<b>I</b>	<b>CO5</b>
<b>UNIT – V</b>			
<b>BRANCH AND BOUND</b>			
<b>Multiple choice Questions</b>			
<b>SL.NO</b>		<b>BT Level</b>	<b>Course Outcome</b>
5C – 1	The Travelling Salesperson Problem (TSP) can be solved using Branch and Bound by: A) Generating all possible permutations of cities B) Using a heuristic to estimate the shortest possible route and pruning paths that exceed this estimate C) Applying a greedy algorithm to select the shortest edge at each step D) Solving the problem by dynamic programming	<b>II</b>	<b>CO6</b>
5C – 2	FIFO Branch and Bound solution primarily uses which data structure to manage the search tree nodes? A) Stack B) Queue C) Priority queue D) Hash table	<b>I</b>	<b>CO6</b>
5C – 3	The Branch and Bound method is typically used for which type of problems? A) Polynomial-time problems B) NP-Hard problems C) Linear programming problems D) Greedy problems	<b>I</b>	<b>CO6</b>
5C – 4	Which of the following is true about NP-Hard problems? A) They are solvable in polynomial time B) They can be solved by a non-deterministic polynomial-time algorithm C) They are at least as hard as the hardest problems in NP D) They can be solved by dynamic programming in polynomial time	<b>II</b>	<b>CO6</b>
5C - 5	Cook's theorem demonstrates that: A) The Traveling Salesperson Problem is NP-Hard B) The class NP is equivalent to the class P C) Any problem in NP can be reduced to the Boolean satisfiability problem (SAT) in polynomial time D) There are no NP-Hard problems	<b>II</b>	<b>CO6</b>
5C - 6	A problem that is both NP-Hard and NP-Complete: A) Can be solved in polynomial time if and only if P = NP B) Can be solved in exponential time but not in polynomial time C) Has a known polynomial-time algorithm for solving it D) Is guaranteed to be solvable in polynomial time	<b>II</b>	<b>CO6</b>
5C - 7	Which of the following is NOT an NP-Complete problem? A) The Boolean Satisfiability Problem (SAT)	<b>II</b>	<b>CO6</b>

	<p>B) The Traveling Salesperson Problem (TSP)  C) The Knapsack Problem  D) The Graph Coloring Problem</p>		
5C - 8	<p>Which theorem proves that the Boolean Satisfiability Problem (SAT) is NP-Complete?  A) Cook's Theorem  B) P=NP Theorem  C) Karp's Theorem  D) Shannon's Theorem</p>	<b>I</b>	<b>CO6</b>
5C - 9	<p>In the context of NP-Complete problems, which of the following statements is TRUE?  A) NP-Complete problems can be solved in polynomial time  B) NP-Complete problems are a subset of NP-Hard problems  C) NP-Complete problems are only solvable in exponential time  D) NP-Complete problems can be solved in polynomial time if and only if P=NP</p>	<b>II</b>	<b>CO6</b>
5C - 10	<p>Which theorem proves that the Boolean Satisfiability Problem (SAT) is NP-Complete?  A) Cook's Theorem  B) P=NP Theorem  C) Karp's Theorem  D) Shannon's Theorem</p>	<b>II</b>	<b>CO6</b>
5C - 11	<p>A problem that can be verified in polynomial time but is not known to be solvable in polynomial time is classified as:  A) NP-Complete  B) NP-Hard  C) P  D) Co-NP</p>	<b>I</b>	<b>CO6</b>
5C - 12	<p>The class of problems that can be solved in polynomial time is denoted by:  A) NP  B) NP-Complete  C) P  D) NP-Hard</p>	<b>I</b>	<b>CO6</b>
5C - 13	<p>The LC Branch and Bound method for solving the 0/1 Knapsack Problem involves:  A) Solving the problem using a greedy approach  B) Relaxing the integer constraints and solving the resulting fractional knapsack problem  C) Generating all possible combinations of items and selecting the optimal one  D) Using a heuristic to approximate the solution</p>	<b>I</b>	<b>CO6</b>
5C - 14	<p>In the Branch and Bound method, what is the primary role of the bounding function?  A) To create a complete search tree  B) To reduce the number of nodes by calculating upper or lower bounds and discarding suboptimal branches  C) To generate all possible solutions to the problem  D) To sort nodes in a priority queue</p>	<b>II</b>	<b>CO6</b>
5C - 15	<p>In the Branch and Bound method, which of the following is used to prune branches of the search tree that cannot lead to an optimal solution?  A) Depth-first search  B) Breadth-first search  C) Bounding function  D) Backtracking</p>	<b>II</b>	<b>CO6</b>
<b>FILL IN THE BLANKS</b>			
5F - 1	<p>The Branch and Bound method is used to solve optimization problems by systematically _____ the search space and using bounds to eliminate suboptimal solutions.</p>	<b>I</b>	<b>CO6</b>
5F - 2	<p>In the Branch and Bound method, the _____ function is used to provide upper or lower bounds to prune branches that cannot lead to an optimal solution.</p>	<b>I</b>	<b>CO6</b>

5F - 3	The Traveling Salesperson Problem (TSP) can be approached using Branch and Bound by estimating the _____ of incomplete tours and pruning those that exceed the current best tour.	<b>II</b>	<b>CO6</b>
5F - 4	The LC Branch and Bound solution for the 0/1 Knapsack Problem involves solving a relaxed version of the problem using _____ programming to determine bounds	<b>I</b>	<b>CO6</b>
5F - 5	FIFO Branch and Bound typically uses a _____ to manage the nodes of the search tree in a first-in, first-out order.	<b>I</b>	<b>CO6</b>
5F - 6	In Branch and Bound, if a node's bound is worse than the current best solution, it is _____ from further consideration.	<b>II</b>	<b>CO6</b>
5F - 7	A common approach in the FIFO Branch and Bound method is to use a _____ to explore nodes level by level.	<b>I</b>	<b>CO6</b>
5F - 8	The Branch and Bound method is particularly useful for solving _____ problems where an exhaustive search is computationally infeasible.	<b>I</b>	<b>CO6</b>
5F - 9	NP-Hard problems are at least as difficult as the hardest problems in NP, and they may or may not be in _____.	<b>I</b>	<b>CO6</b>
5F - 10	A problem is classified as NP-Complete if it can be verified in polynomial time and every problem in _____ can be reduced to it in polynomial time.	<b>I</b>	<b>CO6</b>
5F - 11	If a problem is both NP-Hard and NP-Complete, it means that solving it in polynomial time would imply that _____ = NP.	<b>I</b>	<b>CO6</b>
5F - 12	Non-deterministic algorithms are able to verify solutions in _____ time but do not necessarily solve problems in polynomial time.	<b>I</b>	<b>CO6</b>
5F - 13	The class P consists of problems that can be solved in _____ time.	<b>I</b>	<b>CO6</b>
5F - 14	An NP-Complete problem is a problem for which every problem in NP can be reduced to it in _____ time.	<b>I</b>	<b>CO6</b>
5F - 15	A problem that can be verified in polynomial time but not necessarily solved in polynomial time is classified as _____.	<b>II</b>	<b>CO6</b>

**MATCH THE FOLLOWING**

5M - 1	1.Branch and Bound 2.FIFO Branch and Bound 3.LC Branch and Bound 4. Traveling Salesperson Problem	A. Method used to solve optimization problems B. items can be divided or partially included C. Used to manage nodes in a first-in, first-out order D. Problem of finding the shortest tour	<b>III</b>	<b>CO6</b>
5M - 2	1.0/1 Knapsack Problem 2.NP-Hard 3.NP-Complete 4.Cook's Theorem	A. Problems that are at least as hard as the hardest problems in NP but may not be in NP B. Problems that can be verified in polynomial time and are as hard as any problem in NP C. Proves that the Boolean Satisfiability Problem (SAT) is NP-Complete D. where items can be divided or partially included	<b>III</b>	<b>CO6</b>
5M - 3	1. Non-deterministic Algorithms 2. Class P 3. 0/1 Knapsack Problem 4.TSP Problem	A.Problems that can be solved in polynomial time B. Algorithms that can verify solutions in polynomial time but may not solve the problem in polynomial time C. finds minimum cost tour D. A combinatorial optimization problem where items are either included or excluded	<b>II</b>	<b>CO6</b>
5M - 4	1.Branch and Bound 2.FIFO Branch and Bound 3.LC Branch and Bound 4.Traveling Salesperson Problem (TSP)	A. Uses a queue to explore nodes level by level B. Method for solving optimization problems using bounds to prune suboptimal solutions C. The problem of finding the minimum cost tour visiting each city once and returning to the start D.Solves the 0/1 Knapsack Problem by relaxing integer constraints and using linear programming	<b>II</b>	<b>CO6</b>

5M - 5	1. NP-HardA. Algorithms that verify solutions in polynomial time but may not solve the Problem in polynomial time 2. NP-CompleteB. Problems that are at least as difficult as the hardest problems in NP but may not be in NP 3. Cook's TheoremC. Problems that can be verified in polynomial time and to which any NP problem can be reduced in polynomial time 4. Non-deterministic AlgorithmsD. Proves that SAT is NP-Complete	<b>II</b>	<b>CO6</b>
<b>5 – MARKS QUESTIONS</b>			
5D - 1	Explain General method of Branch and Bound.	<b>II</b>	<b>CO6</b>
5D - 2	Solve the Travelling Salesperson Problem with an example.	<b>VI</b>	<b>CO6</b>
5D - 3	Explain branch and bound method to solve 0/1 knapsack problem	<b>II</b>	<b>CO6</b>
5D - 4	Describe LC Branch and Bound Solution	<b>III</b>	<b>CO6</b>
5D - 5	Distinguish NP-Hard and NP Complete classes	<b>IV</b>	<b>CO6</b>
5D - 6	Explain Cook's Theorem with example	<b>II</b>	<b>CO6</b>
5D - 7	Distinguish between Deterministic and non-deterministic algorithm.(analyzing)	<b>IV</b>	<b>CO6</b>
5D - 8	What is meant by Halting problem explain with an example.	<b>II</b>	<b>CO6</b>
5D - 9	Differentiate between NP-Complete and NP-Hard.	<b>IV</b>	<b>CO6</b>
5D - 10	Explain maximum Clique.	<b>II</b>	<b>CO6</b>
5D - 11	Explain Optimization problem.	<b>II</b>	<b>CO6</b>
5D - 12	Briefly explain the concepts of the NP-Hard and NP-Complete?	<b>II</b>	<b>CO6</b>
5D - 13	Explain the P, NP, NP-Hard and NP- complete classes? Give relationship between them?	<b>II</b>	<b>CO6</b>
5D - 14	Explain Planar graph Coloring.	<b>II</b>	<b>CO6</b>
5D - 15	Explain Maximum Program stored problem	<b>II</b>	<b>CO6</b>

# **MODEL QUESTION PAPER**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

**III B.Tech-II Semester–End Examinations (Model paper)  
Algorithm Design and Analysis-R22INF3212(IT,CSIT,CS)****Duration: 3 Hrs****Max Marks: 60 M****Section – A**

<b>Answer <u>All</u> of the following questions</b>		<b>Marks: 10Qx1M = 10M</b>		
		<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
1	Explain the criteria of Algorithm.	1	CO1	II
2	What is Time Complexity?	1	CO1	I
3	What is Disjoint set?	1	CO2	I
4	Compare union and weighted union operations	1	CO2	IV
5	Explain 0/1 knapsack problem with an example.	1	CO3	II
6	How Reliability Design is achieved	1	CO4	I
7	What is greedy method	1	CO5	I
8	What is knapsack problem how it is different from 0/1 knapsack problem	1	CO5	V
9	Distinguish P and NP problems	1	CO6	IV
10	State and Explain Cooks Theorem	1	CO6	II

**Section – B**

<b>Answer any <u>FIVE</u> questions choosing at least one from each Unit</b>		<b>Marks: 5Qx10M = 50M</b>		
		<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
<b>UNIT-I</b>				
11.	Define Algorithm? Explain characteristics of Algorithm (OR)	10	CO1	II,II
12.	Briefly Explain about binary search with example			
<b>UNIT-II</b>				
13.	What is the general Method of back tracking (OR)	10	CO2	I,II
14.	Explain 8 queen's problem			
<b>UNIT – III</b>				
15.	Apply Dynamic programming for optimal binary search trees. (OR)	10	CO3 CO4	III,V
16.	Justify how Reliability Design is achieved.			
<b>UNIT – IV</b>				
17.	Explain General Method of Greedy Approach (OR)	10	CO5	I,III
18.	Solve Single source shortest path Problem using greedy method			

<b>UNIT – V</b>			
19. Explain Branch and Bound method in solving Travelling sales person problem	10	CO6	II,II
<b>(OR)</b>			
Briefly Explain about P,NP and NP hard Class Problems			

S. N O	Bloom Taxonomy Level	No. Of. Questions	%	Name & Signature of Paper Setter
1	Fundamental Knowledge from level I & II	5	50	
2	Knowledge on application & Analysis from level III & IV	2	20	
3	Critical thinking and ability to design from level V & VI	3	30	

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# MID - I & MID - 2

## QUESTION PAPERS

22CA1812CG

BR-22      **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**      D4  
**III B.Tech - II Semester - I Mid Term Examinations, MARCH - 2025**  
**(BUSINESS) ALGORITHM DESIGN AND ANALYSIS**

(For EE, CS & CSE)  
 Dt: 24-03-2025, Day: 1 (FN)

Duration: 2 Hrs.      Max Marks: 100  
 Bloom's Taxonomy Levels: I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating, and VI-Creating.  
 Course Outcomes: CO

**Part - A (10 Marks)**

**SECTION A1: Answer all multiple choice questions.**

<p>1. Which of the following is the Big-O notation for linear time complexity?                  A) <math>O(1)</math>      B) <math>O(\log n)</math>      C) <math>O(n)</math>      D) <math>O(n^2)</math></p> <p>2. Omega notation (<math>\Omega</math>) provides a lower bound for the time complexity of an algorithm. Which case does it describe?                  A) Best-case scenario      B) Worst-case scenario                  C) Average-case scenario      D) Amortized-case scenario</p> <p>3. Merge Sort uses which of the following approaches?                  A) Greedy algorithm      B) Divide and conquer                  C) Dynamic programming      D) Backtracking</p> <p>4. Strassen's algorithm is used for:                  A) Searching in an array      B) Sorting a list of numbers                  C) Matrix multiplication      D) Finding shortest paths in a graph</p> <p>5. Which of the following operations is not a part of the basic operations of the Union-Find structure?                  A) Find      B) Union      C) Insert      D) Make Set</p> <p>6. Which of the following problems can be solved using the backtracking technique?                  A) Sorting a list of numbers      B) Solving a system of linear equations                  C) N-Queen's problem      D) Calculating the greatest common divisor</p> <p>7. Which of the following is an example of a constraint satisfaction problem that can be solved using backtracking?                  A) Matrix multiplication      B) Graph traversal                  C) Sum of subsets problem      D) Fibonacci sequence calculation</p> <p>8. In the N-Queen's problem, what is the goal?                  A) To place N queens on a chessboard such that no two queens attack each other                  B) To find the shortest path for a knight to visit all squares                  C) To place N rooks on a chessboard such that no two rooks attack each other                  D) To solve a Sudoku puzzle</p> <p>9. What is the primary approach used in dynamic programming to solve problems?                  A) Greedy Method                  B) Divide and Conquer                  C) Breaking problems into simpler sub problems and storing solutions                  D) Brute Force</p> <p>10. In the context of dynamic programming, what is memoization?                  A) A technique to divide the problem into independent sub problems                  B) A method to store the results of expensive function calls and reuse them                  C) A strategy to sort elements in a list                  D) A process to merge sorted arrays</p>	<p>Marks: 10Qs/2M = 5M</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">I</td> <td style="width: 25%;">I</td> <td style="width: 25%;">I</td> <td style="width: 25%;">CO1</td> </tr> <tr> <td>I</td> <td>I</td> <td>I</td> <td>CO1</td> </tr> <tr> <td>I</td> <td>I</td> <td>II</td> <td>CO1</td> </tr> <tr> <td>I</td> <td>I</td> <td>II</td> <td>CO1</td> </tr> <tr> <td>I</td> <td>I</td> <td>I</td> <td>CO2</td> </tr> <tr> <td>I</td> <td>I</td> <td>II</td> <td>CO2</td> </tr> <tr> <td>I</td> <td>I</td> <td>I</td> <td>CO2</td> </tr> <tr> <td>I</td> <td>I</td> <td>III</td> <td>CO2</td> </tr> <tr> <td>I</td> <td>I</td> <td>I</td> <td>CO3</td> </tr> <tr> <td>I</td> <td>I</td> <td>I</td> <td>CO3</td> </tr> </table>	I	I	I	CO1	I	I	I	CO1	I	I	II	CO1	I	I	II	CO1	I	I	I	CO2	I	I	II	CO2	I	I	I	CO2	I	I	III	CO2	I	I	I	CO3	I	I	I	CO3
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P.T.O

**SECTION A2: Answer all fill in the blank questions.**

Marks: 6Qx1/2M = 3M

- |   |    |     |
|---|----|-----|
| 11. The _____ complexity of an algorithm refers to the amount of memory required by the algorithm to run to completion.                     | I  | CO1 |
| 12. Big-O notation is used to describe the _____-case time complexity of an algorithm.  | I  | CO1 |
| 13. Strassen's algorithm is used for _____ multiplication.  | V  | CO1 |
| 14. In the Union-Find algorithm, Union by _____ is used to keep the tree balanced.  | I  | CO2 |
| 15. The Union-Find algorithm is commonly used in _____ algorithms to detect cycles.   | II | CO2 |
| 16. The two key properties that a problem must have to be suitable for dynamic programming are optimal substructure and _____ sub problems. | IV | CO3 |

**SECTION A3: Answer all Match the following questions**

Marks: 2Qx1M = 2M

17.	1. Big-O Notation	A.	Describes an upper bound on time complexity	III	CO1
	2. Omega ( $\Omega$ ) Notation	B.	Describes a lower bound on time complexity		
	3. Theta ( $\Theta$ ) Notation	C.	Describes both upper and lower bounds on time complexity		
	4. Little-o ( $o$ ) Notation	D.	Describes a strict upper bound on time complexity		

18.	1. Sum of Subsets	A.	The minimum no. of colors required.	III	CO2
	2. Graph Coloring	B.	back tracking		
	3. Chromatic Number	C.	Used to explore all possible solutions and backtrack when a partial solution violates constraints		
	4. Hamiltonian Path Problem	D.	Objective is to color the vertices of a graph such that no two adjacent vertices have the same color		

**Part - B (20 Marks)**

**Answer any FOUR questions.**

Marks: 4Qx5M = 20M

- |   |    |     |
|---|----|-----|
| 19. What do you mean by performance analysis of an algorithm? Explain in detail.                                      | I  | CO1 |
| 20. Find Big-o notation and Little-o notation for $f(n) = 7n^3 + 50n^2 + 200$ .                                       | V  | CO1 |
| 21. Explain Strassen's Matrix multiplication with example.  | II | CO1 |
| 22. Explain the usefulness of the following fundamental operations on sets:<br>i) FIND                      ii) UNION | II | CO2 |
| 23. Write Algorithm for graph coloring problem.   | I  | CO2 |
| 24. Explain the general method of Dynamic programming.  | II | CO3 |

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## COURSE OUTCOMES (CO's)

**Academic Year:** 2024-25

**Class** : III YEAR-II SEM.

**Course Name** : EMBEDDED SYSTEMS (R22CSE3147)

At the end of the course, the student will be able to

<b>C323.1</b>	Understand the basics of an embedded system. (Remember)
<b>C323.2</b>	Acquire a basic knowledge about fundamentals of microcontrollers (Apply)
<b>C323.3</b>	Understand the ARM processor architecture(Understand)
<b>C323.4</b>	Able to apply the knowledge to design ARM processor using instruction set to perform various tasks. (Evaluate)
<b>C323.5</b>	Able to apply the knowledge to design and develop embedded firmware and development languages.(Apply)
<b>C323.6</b>	Design real time embedded systems using the concepts of RTOS. (Analyze)

## COURSE ARTICULATION MATRIX

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C323.1	2	-	-	-	-	-	-	-	-	-	-	2	-	2
C323.2	2	-	-	-	-	-	-	-	-	-	-	2	-	2
C323.3	2	-	-	-	-	-	-	-	-	-	-	2	-	2
C323.4	2	-	-	-	-	-	-	-	-	-	-	2	-	2
C323.5	2	-	1	-	1	-	-	-	-	-	-	2	-	2
C323.6	2	-	-	-	-	-	-	-	-	-	-	2	-	2
<b>C323</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2</b>	<b>-</b>	<b>2</b>

**EMBEDDED SYSTEMS**  
**(R22CSE3147)**

# SYLLABUS

BR22 – B.TECH. – INFORMATION TECHNOLOGY

## SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

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3	0	0	3

### (R22CSE3147) EMBEDDED SYSTEMS

#### Course Objectives:

- To explain various embedded system applications and design requirements.
- To construct embedded system hardware.
- To develop software programs to control embedded system.
- To generate product specification for embedded system.

**UNIT – I :** Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT – II : Introduction to Microcontrollers:** Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs

**UNIT – III :** ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

**UNIT IV : Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT – V : RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

#### TEXT BOOK:

- Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
- Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning
- Embedded Systems - Raj Kamal, TMH.
- Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
- Embedded Systems – Lyla, Pearson, 2013
- An Embedded Software Primer - David E. Simon, Pearson Education.
- The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
- The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
- Microcontrollers and Application - Ajay. V. Deshmukh, TMGH, 2005.
- ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012



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**LESSON PLAN**  
**(Regulation :R22)**  
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**Prepared on  
Jan' 2025**

<b>Sub. Code &amp; Title</b>	<b>R22CSE3147- Embedded Systems</b>		
<b>Academic Year: 2024-25</b>	<b>Year/Sem.</b>	<b>III/II</b>	
<b>Faculty Name &amp; Designation</b>	<b>B. DEEPIKA RATHOD &amp; Assoc. Professor</b>		

<b>UNIT – I</b>								
<b>I</b>	<b>INTRODUCTION TO EMBEDDED SYSTEMS</b>	<b>12</b>						
1.1	Definition of Embedded Systems	T1 T3 T4	4 3 1	4	Black board	02		CO-1, K1
1.2	Embedded Systems Vs General computing systems	T1	4	5	Black board	01		CO-1,K2
1.3	History of Embedded systems	T1 T5	5 42	6 43	Black board	01		CO-1,K2
1.5	Classification	T1 T3	7 52	53	Black board	02		CO-1,K4
1.6	Major applications areas	T1 T3 T5	7 27 44	8 28 69	Presentation	02		CO-1,K3
1.7	Purpose of Embedded systems	T1	8	11	Black board	01		CO-1,K5
1.8	Characteristics and quality attributes of embedded systems	T1 T4	72 19	79 24	Black board	03		CO-1,K6
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						
<b>UNIT –II</b>								
<b>II</b>	<b>INTRODUCTION TO MICROCONTROLLERS</b>	<b>13</b>						
2.1	Overview of 8051 Microcontroller	T2	59	60	Black board	02		CO-2,K2
2.2	Architecture	T2	60	72	Black board	02		CO-2,K2
2.3	I/O Ports	T2	73	77	Presentation	02		CO-2,K3
2.4	Memory Organization	T2	78	79	Presentation	02		CO-2,K2
2.5	Addressing Modes and Instruction set of 8051	T2	131	138	Black board	03		CO-2,K3
2.6	Simple Programs	T2	144	148	Black board	02		CO-2,K4
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						



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**UNIT –III**

<b>III</b>	<b>ARM ARCHITECTURE</b>	<b>15</b>	
3.1	ARM Processor fundamentals	T10 19 20	Black board 01 CO-3,K2
3.2	ARM Architecture	T10 20 21 34 43	Black board 01 CO-3,K2
3.3	Register	T10 21 22	Black board 01 CO-3,K2
3.4	CPSR	T10 22 28	Black board 01 CO-3,K2
3.5	Pipeline	T10 29 32	Black board 01 CO-3,K3
3.6	Exceptions and Interrupts	T10 33 34	Black board 01 CO-3,K4
3.7	Interrupt vector table	T10 33 34	Black board 01 CO-4,K3
3.8	ARM instruction set	T10 47 49	Black board 01 CO-4,K3
3.9	Data Processing, Branch instructions	T10 50 59	Black board 01 CO-4,K3
3.10	load store instructions	T10 60 72	Black board 01 CO-4,K3
3.11	Software interrupt instructions	T10 73 74	Black board 01 CO-3,K3
3.12	Program status register instructions	T10 75 77	Black board 01 CO-3,K3
3.13	loading constants, Conditional execution	T10 78 84	Black board 02 CO-4,K3
3.14	Introduction to Thumb instructions	T10 87 100	Black board 01 CO-4,K2
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>	



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**UNIT –IV**

<b>IV</b>	<b>EMBEDDED FIRMWARE</b>			<b>08</b>			
4.1	Reset Circuit	T1 T3	60 11	61 11	Black board	01	CO-5,K2
4.2	Brown-out Protection Circuit	T1	61	61	Black board	01	CO-5,K2
4.3	Oscillator Unit	T1	62	62	Black board	01	CO-5,K2
4.4	Real Time Clock	T1 T3	62 158	62 159	Presentation	01	CO-5,K2
4.5	Watchdog Timer	T1 T3 T4	63 157 88	63 158 90	Presentation	01	CO-5,K3
4.6	Embedded Firmware Design Approaches and Development Languages	T1 T3	302 235	318 28	Black board	03	CO-5,K4
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>					

**UNIT –V**

<b>V</b>	<b>RTOS BASED EMBEDDED SYSTEM DESIGN</b>			<b>10</b>			
5.1	Operating System Basics	T1 T3 T5	382 351 202	386 370 222	Presentation	03	CO-6,K2
5.2	Types of operating Systems	T1 T3 T5	386 370 211	390 384 222	Presentation	01	CO-6,K2
5.3	Tasks, Process, and Threads	T1 T3 T5 T6	390 305 222 137	402 314 228 153	Black board	02	CO-6,K4
5.4	Multiprocessing and Multitasking	T1 T5	402 224	404	Black board	01	CO-6,K5
5.5	Task scheduling	T1 T3 T5 T6	404 385 226 253	422 401 241 259	Black board	03	CO-6,K6
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>					



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### LIST OF TEXT BOOKS AND REFERENCES

#### TEXT BOOK:

- T1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.
- T2. Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning
- T3. Embedded Systems - Raj Kamal, TMH.
- T4. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
- T5. Embedded Systems – Lyla, Pearson, 2013
- T6. An Embedded Software Primer - David E. Simon, Pearson Education.
- T7. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
- T8. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
- T9. Microcontrollers and Application - Ajay. V. Deshmukh, TMGH, 2005.
- T10. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012



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**W1:** [https://en.wikipedia.org/wiki/Embedded\\_system](https://en.wikipedia.org/wiki/Embedded_system)

**W2:** <https://archive.nptel.ac.in/courses/106/105/106105193/>

**W3:** <https://archive.nptel.ac.in/courses/106/105/106105159/>

**W4:** <https://www.cse.iitb.ac.in/~cs330/emb-lect.pdf>

**W5:** <https://www.ee.iitb.ac.in/student/~wel/wel12/Components%20Records/microcontrollers.htm>



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### ASSIGNMENT - 1

ASSIGNMENT QUESTIONS (1.Remembering,2.Understanding,3.Applying,4.Analyzing, 5.Evaluating,6.Creating)				
SET-1 (Roll Nos: 22D41A1201- 22D41A1205)			BT Leve 1	Course Outcome
1	Define Embedded System. Classify different types of embedded systems.	2	CO1	
2	Explain the purpose of embedded systems?	2	CO1	
3	Build an 8051 based assembly language program to add the contents of register R3 and R4 from bank 2?	3	CO2	
4	List the addressing modes of 8051 microcontrollers?	4	CO2	
5	Interpret the general purpose registers of ARM processors.	5	CO3	
SET-2 (Roll Nos: 22D41A1206- 22D41A1210)				
1	What is an embedded system? Contrast an embedded system and a general purpose computer?	2	CO1	
2	Extend the characteristics of embedded system?	2	CO1	
3	Build an 8051 based assembly language program to add the contents of locations 50H and 51H?	3	CO2	
4	List the different types of 8051 instructions.	4	CO2	
5	What is an Exception? Explain the functions of a vector table when Exception occurs?	5	CO3	
SET-3 (Roll Nos: 22D41A1211- 22D41A1215)				
1	Compare embedded system and general computing system, explain with suitable various examples.	2	CO1	
2	List some of the examples for small scale embedded systems.	4	CO1	
3	Build an 8051 based assembly language program to add the contents of memory location addressed by register 1 to the contents of RAM location pointed by register 0.	3	CO2	
4	Choose an example to explain the register indirect addressing mode of microcontroller 8051?	5	CO2	
5	Outline the interrupt vector table in an ARM processor.	2	CO3	
SET-4 (Roll Nos: 22D41A1216- 22D41A1220)				
1	Outline the History of Embedded system.	2	CO1	
2	Build an example for fourth generation embedded system?	3	CO1	
3	Measure the time delay produced by the following subroutine.	5	CO2	
4	Classify the addressing modes of 8051 microcontrollers.	4	CO2	

5	Summarize the interrupts in an ARM processor.	2	CO3
<b>SET-5 (Roll Nos: 22D41A1221- 22D41A1225)</b>			
1	Prioritize the classification of embedded systems with an example for each.	5	CO1
2	Classify the memory in embedded systems?	2	CO1
3	Develop an 8051 based assembly language program to load accumulator A, DPH and DPL with 30H?	3	CO2
4	List the I/O related instructions in microcontroller 8051.	4	CO2
5	Interpret the exceptions in an ARM processor.	2	CO3
<b>SET-6 (Roll Nos: 22D41A1226- 22D41A1230)</b>			
1	Select the embedded systems based on complexity and performance and explain.	5	CO1
2	Relate some of the hardware parts of embedded systems?	2	CO1
3	Develop an 8051 based assembly language program to add two 8-bit numbers.	3	CO2
4	Examine the operation carried out when 8051 executes the instruction MOVC A, @A + DPTR?	4	CO2
5	Explain in brief about various stages of pipelining in ARM processors.	2	CO3
<b>SET-7 (Roll Nos: 22D41A1231- 22D41A1235)</b>			
1	Mention various applications of Embedded System and Explain in detail.	5	CO1
2	Draw and compare von-Neumann and Harvard architecture.	2	CO1
3	Develop an 8051 based assembly language program to add two 16-bit numbers.	3	CO2
4	Discover the data transfer instructions and program control instructions of 8051 microcontroller.	4	CO2
5	Illustrate the pipelining in an ARM processor?	2	CO3
<b>SET-8 (Roll Nos: 22D41A1236- 22D41A1240)</b>			
1	Demonstrate the different applications of embedded systems.	2	CO1
2	Classify the processors in embedded system?	2	CO1
3	Build an 8051 based assembly language program to unpack the packed BCD number stored in the accumulator and save the result in R0 and R1 such that (R0) ← LSB and (R1) ← MSB.	3	CO2
4	Inspect the operation of the given 8051 microcontroller instructions: XRL A, direct?	4	CO2
5	Explain about the instruction pipeline	5	CO3
<b>SET-9 (Roll Nos: 22D41A1241- 22D41A1245)</b>			
1	Illustrate the various purposes of embedded system with relevant examples.	2	CO1
2	Classify the embedded systems?	2	CO1
3	Build an 8051 based assembly language program to subtract two 8-bit numbers and exchange digits.	3	CO2
4	Categorize the instruction set of 8051 microcontroller.	4	CO2
5	Choose various types of ARM Registers and explain?	5	CO3
<b>SET-10 (Roll Nos: 22D41A1246- 22D41A1250)</b>			
1	Prioritize the general characteristics of embedded systems in detail.	5	CO1
2	Illustrate the main components of an embedded system?	2	CO1
3	Build an 8051 based assembly language program for division of two 8-bit numbers.	3	CO2
4	Inspect how can you perform multiplication using 8051 microcontroller?	4	CO2
5	Summarize the current program status register (CPSR) with neat diagram.	2	CO3
<b>SET-11 (Roll Nos: 22D41A1251- 22D41A1255)</b>			
1	Organize the quality attributes of an embedded system.	3	CO1

2	What is an embedded system? Summarize the components of embedded system?	2	CO1
3	Build an 8051 based assembly language program to multiply two 8-bit numbers.	5	CO2
4	List the arithmetic instructions of microcontroller 8051?	4	CO2
5	Draw and explain current program status register of ARM processor.	2	CO3
<b>SET-12 (Roll Nos: 22D41A1256- 22D41A1260)</b>			
1	Explain quality attribute in the embedded system development context.	2	CO1
2	Outline the applications of an embedded system?	2	CO1
3	Build an 8051 based assembly language program to convert 8-bit binary number to its equivalent BCD	3	CO2
4	Select any four-bit manipulation instructions in microcontroller 8051 and explain?	5	CO2
5	Contrast the general purpose registers of ARM processors.	4	CO3
<b>SET-13 (Roll Nos: 22D41A1261- 22D41A1263)</b>			
1	What is non-operational quality attribute? Explain the important non-operational quality attributes to be considered in any embedded system design.	2	CO1
2	Discover the different present technologies used in embedded systems.	4	CO1
3	Develop an 8051 based assembly language program to add two 16-bit BCD numbers.	3	CO2
4	Intrepret the various operations performed by boolean variable instructions of 8051?	5	CO2
5	Explain the ARM Architecture with a neat diagram?	2	CO3
<b>SET-14 (Roll Nos: 23D41A1202-23D45A1206)</b>			
1	Build an example for second generation embedded system?	5	CO1
2	What are the operational attributes of an embedded system? Explain.	2	CO1
3	Develop an 8051 based assembly language program to find the maximum number from a given 8-bit ten numbers.	3	CO2
4	Explain the various bit manipulation instructions in 8051 with examples.	2	CO2
5	Inference the ARM processor fundamentals.	4	CO3



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**ASSIGNMENT – 2**

**ASSIGNMENT QUESTIONS**

**(1.Remembering2.Understanding,3.Applying4.Analyzing, 5.Evaluating6.Creating)**

**SET-1 (Roll Nos: 22D41A1201- 22D41A1205)**

		<b>BT Level</b>	<b>Course Outcome</b>
1	Support the instruction set of ARM processor with examples?	5	CO4
2	Illustrate the role of reset circuit in embedded system.	2	CO5
3	Explain the advantages, disadvantages and limitations of assembly language based embedded firmware development.	2	CO5
4	Identify the need to have user space and kernel space separate?	3	CO6
5	Compare pre-emptive and non-pre-emptive scheduling.	4	CO6

**SET-2 (Roll Nos: 22D41A1206- 22D41A1210)**

1	Interpret the ARM processor Data processing instructions with an example.	2	CO4
2	Relate the need of brown out protection circuit in Embedded systems.	2	CO5
3	Identify the limitations of assembly language based embedded firmware development.	3	CO5
4	Inspect on what basis RTOS is going to be chosen?	4	CO6
5	What is task scheduling? Explain Round Rabin scheduling algorithm?	5	CO6

**SET-3 (Roll Nos: 22D41A1211- 22D41A1215)**

1	Illustrate the ARM arithmetic instructions with an example.	2	CO4
2	Examine the role of Watch dog Timer and oscillator unit in embedded system.	4	CO5
3	What is the need of an embedded firmware? Briefly explain the embedded firmware development languages.	3	CO5
4	Explain the different functional and non-functional requirements that need to be evaluated in the selection of an RTOS.	5	CO6
5	Define the term Multitasking. How the multitasking is distinguished with multiprocessing?	2	CO6

**SET-4 (Roll Nos: 22D41A1216- 22D41A1220)**

1	How the branch instructions in ARM programming used to change the flow of execution with an example?	2	CO4
2	Summarize the role of real time clock in embedded system.	2	CO5
3	What is embedded firmware? What are the different approaches available for embedded firmware development? Explain.	5	CO5
4	Develop the real time operating systems. Compare its features with window based real time operating systems.	3	CO6
5	Compare pre-emptive and non-pre-emptive scheduling.	4	CO6

**SET-5 (Roll Nos: 22D41A1221- 22D41A1225)**

1	Explain the following ARM instructions with an example i) Move ii) Comparison iii) Multiply	5	CO4
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2	Discover the following i) Brownout protection circuit ii) Real Time Clock.	4	C05
3	Build the embedded firmware design.	3	C05
4	Explain task, process and thread with their types and examples which aids the real time system.	2	C06
5	Classify the different types of multitasking?	2	C06
<b>SET-6 (Roll Nos: 22D41A1226- 22D41A1230)</b>			
1	Model the following ARM instructions with an example i) Software interrupt ii) load-store instructions	3	C04
2	Interpret the following terms (i) Oscillator unit (ii) Watch Dog Timer	2	C05
3	Explain the importance of real time clock?	5	C05
4	List different types of operating systems.	4	C06
5	Compare and contrast the multitasking and multiprocessing?	2	C06
<b>SET-7 (Roll Nos: 22D41A1231- 22D41A1235)</b>			
1	Outline the PSR Instructions with examples.	2	C04
2	Judge the role of Brown out protection circuit in embedded system.	5	C05
3	Discover the significance of Watchdog timer in an Embedded System.	4	C05
4	What is a process? Make use of a neat representation explain the process states and state transition.	3	C06
5	Justify the use of a thread in a process.	2	C06
<b>SET-8 (Roll Nos: 22D41A1236- 22D41A1240)</b>			
1	Explain about Loading constants?	5	C04
2	What is embedded firmware? Extend the different approaches available for embedded firmware development?	2	C05
3	Make use of a neat diagram discuss the following terms in Embedded Processor a) Watch dog Timer b) Real Time Clock.	3	C05
4	Contrast process and thread. Write some examples.	4	C06
5	What is a process? With a neat representation explain the process states and state transition.	2	C06
<b>SET-9 (Roll Nos: 22D41A1241- 22D41A1245)</b>			
1	Build an example to increase the performance and code density of ARM using conditional execution instructions.	3	C04
2	Outline the following terms in Embedded System with the help of a neat diagram? a) Watch dog Timer b) Real Time Clock.	2	C05
3	Examine the role of reset circuit in embedded system.	4	C05
4	Justify the use of a thread in a process.	5	C06
5	Explain the various activities involved in the creation of processes and threads.	2	C06
<b>SET-10 (Roll Nos: 22D41A1246- 22D41A1250)</b>			
1	Extend a short note on thumb instruction set?	2	C04
2	Explain the significance of Watchdog timer in an Embedded System.	5	C05
3	Identify the role of real time clock in embedded system.	3	C05
4	Summarize the Round Robin scheduling algorithm?	2	C06
5	List different types of operating systems.	4	C06
<b>ET-11 (Roll Nos: 22D41A1251- 22D41A1255)</b>			
1	Choose the examples of PSR Instructions and explain?	3	C04
2	Illustrate the concept of watch dog timer.	2	C05
3	Interpret the role of real time clock in embedded system.	5	C05
4	Compare and Contrast multitasking and multiprocessing?	4	C06
5	Explain task, process and thread with their types and examples which aids the real time system.	2	C06
<b>SET-12 (Roll Nos: 22D41A1256- 22D41A1260)</b>			
1	Explain about the Loading constants?	5	C04
2	Develop the embedded firmware design.	3	C05
3	Outline the following terms (i) Oscillator unit (ii) Watch Dog Timer	2	C05

4	Classify the types of multitasking?	2	CO6
5	Compare and contrast process and thread with some examples.	4	CO6
<b>SET-13 (Roll Nos: 22D41A1261- 22D41A1263)</b>			
1	With an example explain, how to increase the performance and code density of ARM using conditional execution instructions.	2	CO4
2	Explain the role of firmware in an embedded system's boot process.	5	CO5
3	Inspect the role of Watch dog Timer and oscillator unit in embedded system.	4	CO5
4	Define the term Multitasking. Identify how the multitasking is distinguished with multiprocessing.	3	CO6
5	Describe the real time operating systems. Compare its features with window based real time operating systems.	2	CO6
<b>SET-14 (Roll Nos: 23D41A1202-23D45A1206)</b>			
1	Explain the importance of thumb instruction set?	5	CO4
2	What is the need of an embedded firmware? Demonstrate the embedded firmware development languages.	2	CO5
3	Examine the need of brown out protection circuit in Embedded systems.	4	CO5
4	What is task scheduling? Summarize the Round Rabin scheduling algorithm?	2	CO6
5	Identify on what basis RTOS is going to be chosen?	3	CO6

#### SELF STUDY TOPICS

S.No.	Topics	Books & Journals	Course Outcomes
1	Purpose of Embedded Systems	Introduction to Embedded Systems – Shibu K.V, Mc Graw Hill	CO-1
2	Operating System Basics	Embedded Systems – Raj Kamal, TMH	CO-6

## **QUESTION BANK**



**SRI INDU COLLEGE OF ENGINEERING &  
TECHNOLOGY  
QUESTION BANK  
(Regulation :R22)**

**Prepared on  
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**DEPARTMENT OF INFORMATION TECHNOLOGY**

**Sub. Code & Title      R22CSE3147- Embedded Systems**

**Academic Year: 2024-25      Year/Sem.      III/II**

**Faculty Name & Designation      B. DEEPIKA RATHOD & Assoc. Professor**

**QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)**

(1.REMEMBERING 2 .UNDERSTANDING3.APPLYING4.ANALYSING5.EVALUATING 6.CREATING)

**UNIT –I  
INTRODUCTION TO EMBEDDED SYSTEMS**

<b>SL.NO</b>	<b>MULTIPLE CHOICE QUESTIONS</b>	<b>BT Level</b>	<b>Course Outcome</b>
1C - 1	An embedded system is a combination of _____ a) Software b) Hardware c) Both a and b d) Devices	<b>I</b>	<b>CO1</b>
1C - 2	Which of the following statements are true for von Neumann architecture?  a) shared bus between the program memory and data memory b) separate bus between the program memory and data memory c) external bus for program memory and data memory d) external bus for data memory only	<b>III</b>	<b>CO1</b>
1C - 3	How many types of timing constraints are there in every real-time system?  a) 6 b) 5 c) 4 d) 2	<b>I</b>	<b>CO1</b>
1C - 4	How embedded systems communicate with the outside world? a) Memory b) Output c) Peripherals d) Input	<b>I</b>	<b>CO1</b>
1C - 5	Which of the following unit protects the memory? a) memory management unit b) peripheral unit c) execution unit	<b>I</b>	<b>CO1</b>

	d) bus interface unit		
1C - 6	Which of the following is an example of small scale embedded system? a) Printer b) DSP a) c) Multiplexer b) d) IP Cameras	<b>I</b>	<b>CO1</b>
1C - 7	Which of these designs considers both the software and hardware during the embedded design? a) Peripheral Design b) Platform-Based Codesign c) Software/Hardware Design d) Memory Design	<b>I</b>	<b>CO1</b>
1C - 8	Which is the most basic non-volatile memory? a) Flash memory b) PROM c) EPROM d) ROM	<b>II</b>	<b>CO1</b>
1C - 9	What is the purpose of address bus? a) to provide data to and from the chip b) to select a specified chip c) to select a location within the memory chip d) to select a read/write cycle	<b>I</b>	<b>CO1</b>
1C - 10	Which of the following is/are not the hardware components of an embedded system? a) Linker b) Loader c) Compiler d) d) All the above	<b>II</b>	<b>CO1</b>
1C - 11	Which of the following are the characteristics of an ES? a) Unique functionality b) Constraint metrics c) Real time based application d) d) All the above	<b>I</b>	<b>CO1</b>
1C - 12	Which of the following ES is called micro-computer? a) Microprocessor b) Micro controller c) ASIC d) ASSP	<b>I</b>	<b>CO1</b>

IC - 13	Which of the following is considered as the heart component of ES? a) Software b) Processor c) Memory d) Hardware	<b>I</b>	<b>CO1</b>
IC - 14	Which of the following are disadvantages of embedded system? a) High technology b) Long marketing c) High cost d) Both a and b	<b>I</b>	<b>CO1</b>
IC - 15	Which of the following are the characteristics of an ES? a) Unique functionality b) Constraint metrics c) Real time based application d) All the above	<b>II</b>	<b>CO1</b>

**FILL IN THE BLANKS**

1F - 1	_____ Programming language can embedded software be programmed in?	<b>I</b>	<b>CO1</b>
1F - 2	_____ is an example of medium scale embedded system.	<b>II</b>	<b>CO1</b>
1F - 3	If the deadline of an embedded system cannot complete its task within its deadline, then it is called _____ type of embedded system.	<b>I</b>	<b>CO1</b>
1F - 4	_____ embedded systems devices communicate with servers.	<b>III</b>	<b>CO1</b>
1F - 5	_____ embedded system software converts each line of assembly based code to machine based code at a time.	<b>I</b>	<b>CO1</b>
1F - 6	_____ hardware is used as alternative for an embedded system.	<b>I</b>	<b>CO1</b>
1F - 7	An embedded system contains _____ number of bit processor.	<b>I</b>	<b>CO1</b>
1F - 8	DMA stands for _____	<b>I</b>	<b>CO1</b>
1F - 9	A program contains _____ number of bit register to store address of succeeding instruction.	<b>I</b>	<b>CO1</b>
1F - 10	_____ is the location for a stack pointer?	<b>II</b>	<b>CO1</b>
1F - 11	One of the earliest examples of an embedded system was the _____	<b>I</b>	<b>CO1</b>
1F - 12	Embedded systems are designed to perform _____, often with limited resources	<b>I</b>	<b>CO1</b>
1F - 13	The software on embedded systems is often referred to as _____	<b>I</b>	<b>CO1</b>
1F - 14	_____ gives the frequency of failures in hours/weeks/months.	<b>I</b>	<b>CO1</b>

IF – 15	Quality attributes can be classified as _____	IV	CO1
<b>MATCH THE FOLLOWING</b>			
1M-1	1. Second Generation                      A. ASIP 2. First Generation                         B. SCADA 3. Third Generation                         C. SOC 4. Fourth Generation                        D. Z80	III	CO1
1M-2	1. Small Scale ES                      A. MIDs 2. Large Scale ES                         B. Slightly complex in hardware and firmware. 3. Medium Scale ES                        C. Performance is not time critical 4. Fourth Generation                       D. RSOCs or multicore processors.	IV	CO1
1M-3	1. Firmware                                 A. Special purpose Hardware 2. Embedded system                        B. applications alterable by end user. 3. General purpose system                 C. may not contain OS 4. Small Scale ES                         D. non alterable by end user.	I	CO1
1M-4	1. Lunar Excursion module                A. 1966 2. Apollo Guidance Computer             B. DSKY 3. Medium scale ES                         C. 1968 4. AGC user interface                       D. GPOS/RTOS	I	CO1
1M – 5	1. Reactive and real time                 A. missing a deadline not critical 2. Event triggered                         B. timing behaviour deterministic 3. Soft real time system                    C. catastrophic consequences if deadline missed 4. Hard real time systems                 D. activities within system are dynamic	II	CO1
<b>5 – MARKS QUESTIONS</b>			
1D – 1	Define Embedded System. Classify different types of embedded systems.	I	CO1
1D – 2	What is an embedded system? List out the differences between an embedded system and a general purpose computer?	IV	CO1
1D – 3	Compare embedded system and general computing system, explain with suitable various examples.	V	CO1
1D – 4	Outline the History of Embedded system.	II	CO1
1D – 5	Build an example for fourth generation embedded system?	III	CO1
1D – 6	Categorize the classification of embedded systems with an example for each.	IV	CO1
1D – 7	Classify the embedded systems based on complexity and performance and explain.	II	CO1
1D – 8	Mention various applications of Embedded System and Explain in detail.	V	CO1
1D – 9	Demonstrate the different applications of embedded systems.	II	CO1
1D – 10	Illustrate the various purposes of embedded system with relevant examples.	II	CO1
1D – 11	Prioritize the general characteristics of embedded systems in detail.	V	CO1
1D – 12	Organize the quality attributes of an embedded system.	III	CO1
1D – 13	Explain quality attribute in the embedded system development context. Build an example for second generation embedded system?	II	CO1
1D – 14	What is non-operational quality attribute? Explain the important non-operational quality attributes to be considered in any embedded system design.	V	CO1
1D – 15	a) What are the operational attributes of an embedded system? Explain. b) Discover the different present technologies used in embedded systems.	IV	CO1
<b>UNIT – II</b>			
<b>INTRODUCTION TO MICROCONTROLLERS</b>			
<b>SL.NO</b>	<b>MULTIPLE CHOICE QUESTIONS</b>	<b>BT Level</b>	<b>Cours e</b>

			<b>Outco me</b>
2C - 1	1. In embedded memory microcontroller has _____ a) Programs, data b) Counters, timers c) Input/output ports d) d) All of the above	<b>I</b>	<b>CO2</b>
2C - 2	The 8-bit microcontrollers are used to execute _____ a) Arithmetic operations only b) Logical operations only c) Both a and b d) d) None of the above	<b>I</b>	<b>CO2</b>
2C - 3	How many of microcontrollers are there based on instruction set? a) One b) Two c) Three d) d) Four	<b>I</b>	<b>CO2</b>
2C - 4	The microcontrollers based on memory classified into _____ a) 8 bit, 16 bit, 32 bit b) Embedded memory, external memory c) RISC, CISC d) d) All of the above	<b>II</b>	<b>CO2</b>
2C - 5	. How many of microcontrollers are there based on bits? a) One b) Two c) Three d) d) Four	<b>I</b>	<b>CO2</b>
2C - 6	Which of the following specifies pin number 40 in 8051 controller IC? a) Vcc b) Vdd c) RST d) d) Vs	<b>II</b>	<b>CO2</b>
2C - 7	8051 type controller is designed with how many bits? a) 4 bit b) 8 bit c) c)16 bit d) d)32 bit	<b>I</b>	<b>CO2</b>
2C - 8	8051 type controller IC has _____ number pin. a) 20 b) 10 c) 30 d) d) 40	<b>I</b>	<b>CO2</b>
2C - 9	Which of the following specifies pin 9 in 8051 Microcontroller IC? a) RST b) Vss c) T0 d) d) Ports	<b>I</b>	<b>CO2</b>
2C - 10	8051 has _____ number of ROM space. a) 4K b) 8K c) 0K d) d) 128K	<b>III</b>	<b>CO2</b>
2C - 11	8051 has _____ number of RAM space. a) 4K	<b>I</b>	<b>CO2</b>

	b) 8K c) 0K d) d) 128K			
2C - 12	Which of the following is an example of opcode? a) 2 b) ADD A,B c) @# d) d) None of the above	I	CO2	
2C - 13	Which of the following is an example of immediate type addressing mode in ES? a) MOV A, #6AH b) MOV A, 04H c) MOV A, R4 d) d) All the above	II	CO2	
2C - 14	The microcontrollers are used in _____ a) Computers, laptops, televisions b) Printers, refrigerators c) Microwave ovens d) d) All of the above	II	CO2	
2C - 15	Which of the following is an example of direct type addressing mode in ES? a) MOV A, #6AH b) MOV A, 04H c) MOV A, R4 d) d) All the above	II	CO2	
<b>FILL IN THE BLANKS</b>				
2F - 1	Microcontroller 8051 has a _____ address bus for transferring the data.	I	CO2	
2F - 2	Microcontroller 8051 has 8 bits of the _____ bus, which is used to carry data of particular applications.	II	CO2	
2F - 3	_____ is the brain of any processing device of the microcontroller.	I	CO2	
2F - 4	The memory which is used to store the program of the microcontroller is known as _____.	I	CO2	
2F - 5	_____ is a collection of wires which work as a communication channel or medium for transfer of Data.	I	CO2	
2F - 6	Buses consist of _____ wires of the microcontroller.	II	CO2	
2F - 7	Microcontroller 8051 has an _____ which works as a clock source for Central Processing Unit of the microcontroller.	I	CO2	
2F - 8	_____ is an example of embedded memory microcontroller.	I	CO2	
2F - 9	_____ is the architecture of the 8051 microcontroller.	I	CO2	
2F - 10	_____ is the bit size of the accumulator in the 8051 microcontroller	I	CO2	
2F - 11	The default clock frequency for the 8051 microcontroller is _____	I	CO2	
2F - 12	Special Function Registers are _____ in the 8051 microcontroller	III	CO2	
2F - 13	_____ is the maximum size of the RAM in the 8051 microcontroller.	I	CO2	
2F - 14	_____ instruction is used to stop the execution of the 8051 microcontroller in an infinite loop.	III	CO2	
2F - 15	The _____ in the 8051 microcontroller is used to access which memory type.	I	CO2	
<b>MATCH THE FOLLOWING</b>				
2M - 1	1. 8051 RAM size 2. 8051 ROM size 3. I/O lines 4. External RAM	A. 32 B. 64K bytes C. 4K bytes D. 128 bytes	II	CO2

2M - 2	1. DPTR execute 2. Program Counter (PC) 3. Register 'A' RAM 4. Register 'B'	A. store the address of the next instruction to B. multiplication and division operation C. used to hold address of external or internal D. used by all arithmetic and logical operation	<b>I</b>	<b>CO2</b>
2M - 3	1. Data transfer instructions 2. Accumulator Specific 3. Bit operations 4. Control operations	A. MOVX, MOVC, XCH B. CALL, JUMP, RET C. MOV, PUSH, POP D. CLR, SETB, CPL, ANL	<b>IV</b>	<b>CO2</b>
2M - 4	1. Immediate Addressing mode 2. Register Addressing 3. Indexed Addressing 4. Direct Addressing	A. MOVC A, @A+PC B. MOC A, 60H C. MOV A, R0 D. MOV A, #54H	<b>IV</b>	<b>CO2</b>
2M - 5	1. Program Status word 2. Serial data buffer 3. Program memory 4. Special function registers	A. executable program code B. accessed by direct addressing only C. two independent registers D. 4 conditional flags and 3 control flags	<b>III</b>	<b>CO2</b>

**5 – MARKS QUESTIONS**

2D - 1	Make use of a neat internal block schematic and explain the architecture of 8051.	<b>III</b>	<b>CO2</b>
2D - 2	Classify the various addressing modes in the 8051 microcontroller with example for each?	<b>IV</b>	<b>CO2</b>
2D - 3	With the help of neat diagrams, Demonstrate the differences between microprocessors and microcontrollers.	<b>II</b>	<b>CO2</b>
2D - 4	A) List the features of 8051 microcontroller. B) Mention the applications of microcontrollers in everyday life.	<b>IV</b>	<b>CO2</b>
2D - 5	With the help of a neat block diagram, Develop the internal architecture of 8051 microcontroller in detail.	<b>III</b>	<b>CO2</b>
2D - 6	Draw the flag register of 8051 $\mu$ C and Examine the functionality of each flag in detail	<b>IV</b>	<b>CO2</b>
2D - 7	Mention the various registers present in 8051 $\mu$ C and explain their functionality in detail	<b>II</b>	<b>CO2</b>
2D - 8	Draw the pin diagram of 8051 $\mu$ C and describe the functionality of each pin in detail.	<b>II</b>	<b>CO2</b>
2D - 9	Describe the functionality of I/O ports present in 8051 $\mu$ C.	<b>II</b>	<b>CO2</b>
2D - 10	Describe how the memory is organized in 8051 $\mu$ C in detail.	<b>IV</b>	<b>CO2</b>
2D - 11	a) Define addressing mode. b) List various addressing modes of 8051 microcontroller and explain them with an example each.	<b>II</b>	<b>CO2</b>
2D - 12	a) Write a short note on assembly language programming. b) Explain the moving data instructions of 8051 $\mu$ C with an example.	<b>V</b>	<b>CO2</b>
2D - 13	Explain the logical Instructions of 8051 $\mu$ C with an example.	<b>III</b>	<b>CO2</b>
2D - 14	Explain Jump and Call instructions of 8051 $\mu$ C with an example.	<b>II</b>	<b>CO2</b>
2D - 15	Write an assembly program of 8051 $\mu$ C to multiply two 8-bit numbers and store the result in a memory location.	<b>IV</b>	<b>CO2</b>
2D - 16	a) Discover the various arithmetic operations performed in assembly language. b) Explain the arithmetic Instructions of 8051 $\mu$ C with an example.	<b>IV</b>	<b>CO2</b>

2D - 17	a) Make use of suitable example to explain the operation of return instruction in 8051 $\mu$ C. b) Identify how the 8051 $\mu$ C performs rotate and swap operations with an example.	<b>III</b>	<b>CO2</b>
<b>UNIT – III ARM ARCHITECTURE</b>			
<b>SL.NO</b>	<b>MULTIPLE CHOICE QUESTIONS</b>	<b>BT Level</b>	<b>Course Outcome</b>
3C - 1	What does ARM stand for? a) Advanced RISC Machine b) Advanced Risk Machine c) Accelerated RISC Machine d) Automated RISC Machine	<b>I</b>	<b>CO3</b>
3C - 2	ARM processors are based on which architecture? a) CISC (Complex Instruction Set Computing) b) RISC (Reduced Instruction Set Computing) c) VLIW (Very Long Instruction Word) d) MIPS (Microprocessor without Interlocked Pipeline Stages)	<b>II</b>	<b>CO3</b>
3C - 3	Which of the following is true about ARM processors? a) They are generally slower than CISC processors b) They use fewer instructions per cycle c) They are optimized for high power consumption d) They have a complex instruction set	<b>I</b>	<b>CO3</b>
3C - 4	ARM processors are widely used in which of the following devices? a) Personal computers b) Embedded systems c) Mainframe computers d) Supercomputers	<b>I</b>	<b>CO3</b>
3C - 5	Which of the following ARM processor features helps in reducing power consumption? a) Pipeline stages b) Thumb instruction set c) Multi-core processing d) Floating-point unit	<b>II</b>	<b>CO3</b>
3C - 6	Which of the following is the ARM architecture's approach to handling interrupts? a) Single interrupt priority b) Interrupt vector table c) Using a separate interrupt processor d) Multiple interrupt lines	<b>III</b>	<b>CO3</b>
3C - 7	Which of the following is a key advantage of ARM processors over other processors? a) Higher clock speeds b) Simplified instruction set c) Higher instruction density d) Use of multiple cores	<b>I</b>	<b>CO3</b>
3C - 8	Which ARM feature allows for more efficient execution of conditional instructions? a) Predictive branching b) Conditional execution of instructions c) Dual execution pipelines d) Memory-mapped registers	<b>III</b>	<b>CO3</b>
3C - 9	What does the CPSR (Current Program Status Register) hold in ARM architecture? a) The contents of the stack b) The current status of the program c) The values of the registers d) The address of the next instruction	<b>I</b>	<b>CO3</b>

3C - 10	In an ARM pipeline, how many stages are there in the standard pipeline for ARM7? a) 2 stages b) 3 stages c) 5 stages d) 7 stages	I	CO3
3C - 11	Which exception in ARM processors is responsible for handling external interrupts? a) IRQ (Interrupt Request) b) SWI (Software Interrupt) c) Undefined instruction d) Reset	IV	CO3
3C - 12	What happens during an exception in ARM processors? a) The processor continues executing the next instruction b) The processor jumps to an exception vector table c) The processor shuts down d) The processor executes the next instruction without any delay	I	CO4
3C - 13	What does the ARM processor's B (Branch) instruction do? a) It performs a conditional jump b) It transfers data between registers c) It moves a value to a memory location d) It sets the program counter to a specified value	III	CO4
3C - 14	What is the primary function of the MOV instruction in ARM? a) To multiply two registers b) To perform bitwise operations c) To load a value into a register d) To move a value into memory	IV	CO4
3C - 15	What is the purpose of the ARM Thumb instruction set? a) To reduce the number of cycles per instruction b) To increase code density for lower memory usage c) To improve floating-point calculations d) To support 64-bit computing	IV	CO4
<b>FILL IN THE BLANKS</b>			
3F - 1	_____ is a major feature of the ARM processor	I	CO3
3F - 2	_____ is the maximum number of general-purpose registers in ARM architecture	IV	CO3
3F - 3	_____ exception mode in ARM processors is used for handling fast interrupts?	I	CO3
3F - 4	_____ is NOT a flag in the CPSR	IV	CO3
3F - 5	_____ registers can be accessed to read or write the CPSR in ARM architecture?	II	CO3
3F - 6	_____ pipeline hazard occurs due to branches and jumps in ARM processors?	II	CO3
3F - 7	In ARM pipelining, _____ refer to the temporary delay in the pipeline caused by a hazard	II	CO3
3F - 8	_____ is the exception type triggered by a division by zero in ARM processors?	II	CO3
3F - 9	_____ exception is located at the first entry of the ARM interrupt vector table?	II	CO3
3F - 10	_____ register is part of the Program Status Register (PSR) in ARM processors	I	CO3
3F - 11	_____ mode is NOT available in ARM processors	I	CO3
3F - 12	_____ is used to store the program status during exceptions	I	CO3
3F - 13	_____ addressing mode is primarily used in ARM architecture	I	CO3
3F - 14	In ARM, _____ instruction is used to modify the CPSR directly.	II	CO4
3F - 15	In ARM, _____ instruction performs a shift operation on the value in a register.	II	CO4
<b>MATCH THE FOLLOWING</b>			

3M – 1	1. Interrupt vector table 2. Program Status Register in ARM 3. ARM instruction "MSR" handlers 4. TST CPSR	A. hold the flags and control bits B. used to update the CPSR flags C. To store the addresses of exception D. copies a value from a register to the	I	CO3
3M – 2	1. CPSR 2. Program Counter (PC) 3. ARM Processors 4. 'M' field in ARM	A. store the address of the next instruction to execute B. processor's current mode C. used to store the current program status D. 32 general-purpose registers	I	CO3
3M – 3	1. Conditional execution 2. ARM processors 3. Control hazard 4. Pipeline	A. 5-stage pipeline B. occurs when an instruction alters PC C. holds up execution to resolve a hazard D. used to control the execution of instructions	II	CO3
3M – 4	1. ARM processors 2. ARM pipeline stage 3. Structural hazard 4. Branch prediction	A. need to use a resource that is already in use B. multi-stage pipeline C. used to handle control hazards D. Write-back (WB)	I	CO4
3M – 5	1. Thumb mode 2. Supervisor mode 3. FIQ mode 4. IRQ mode	A. processing interrupt B. increases processing speed C. standard interrupt D. to start up or reset	II	CO4

**5 – MARKS QUESTIONS**

3D – 1	Elaborate the ARM processor fundamentals.		VI	CO3
3D – 2	Utilize a neat diagram to explain the ARM Architecture		III	CO3
3D – 3	Contrast the general purpose registers of ARM processors.		IV	CO3
3D – 4	Draw and explain current program status register of ARM processor.		II	CO3
3D – 5	Make up current program status register (CPSR) with neat diagram.		VI	CO3
3D – 6	a) Discuss about various types of ARM Registers. b) Develop the instruction pipeline.		VI	CO3
3D – 7	What is pipelining in a processor? Explain in brief about various stages of pipelining in ARM processors.		II	CO3
3D – 8	Summarize the exceptions, interrupts and the vector table in an ARM processor.		II	CO3
3D - 9	What is an Exception? List out the functions of a vector table when Exception occurs?		IV	CO3
3D - 10	Discuss the instruction set of ARM processor with examples?		VI	CO4
3D - 11	Explain ARM processor Data processing instructions with an example.		II	CO4
3D - 12	(a). Illustrate the ARM arithmetic instructions with an example. (b). How the branch instructions in ARM programming used to change the flow of execution with an example?		II	CO4
3D - 13	Explain the following ARM instructions with an example i) Move ii) Comparison iii) Multiply		V	CO4
3D - 14	Model the following ARM instructions with an example i) Software interrupt ii) load-store instructions		III	CO4
3D – 15	Outline the PSR Instructions with examples.		II	CO4
3D – 16	Discuss in detail about Loading constants?		VI	CO4
3D – 17	Build an example to increase the performance and code density of ARM using conditional execution instructions.		III	CO4
3D – 18	Extend a short note on thumb instruction set?		II	CO4

**UNIT IV  
EMBEDDED FIRMWARE**

SL.NO	MULTIPLE CHOICE QUESTIONS	BT Level	Course Outcome
4C – 1	What is the primary purpose of a reset circuit in embedded systems? A) To shut down the system B) To load the operating system C) To initialize the system to a known state D) To increase the clock speed	II	CO5
4C – 2	In embedded firmware, what is typically the first code that executes after a reset? A) Interrupt handler B) Main() function C) Startup code or Reset vector D) Bootloader	IV	CO5
4C – 3	What is the purpose of a Brown-Out Protection (BOP) circuit in embedded systems? A) To prevent overheating B) To prevent the system from operating at dangerously low voltage levels C) To increase system performance D) To manage external device communications	II	CO5
4C – 4	What does a Brown-Out Reset (BOR) do? A) Changes the voltage threshold of the power supply B) Shuts down all system timers C) Resets the microcontroller when supply voltage drops below a threshold D) Increases power supply voltage	III	CO5
4C – 5	What is the primary function of an oscillator in an embedded system? A) Generate memory addresses B) Provide timing and clock signals C) Control I/O ports D) Enable voltage regulation	I	CO5
4C – 6	Which component helps stabilize the oscillator signal in a microcontroller? A) Capacitor B) Diode C) Transistor D) Inductor	I	CO5
4C – 7	What is the main function of a Real Time Clock (RTC) in an embedded system? A) To manage power supply B) To keep track of the current time and date C) To control external devices D) To generate PWM signals	II	CO5
4C – 8	What happens if an RTC loses power without a backup battery? A) It automatically syncs with internet time B) It continues operating normally C) It resets the time and date to default D) It saves the last time in flash memory	II	CO5
4C – 9	Which of the following is typically used to power an RTC when the main system is powered off? A) Solar panel B) Backup battery (or coin cell) C) External AC supply D) Power from UART port	I	CO5
4C – 10	What is the primary purpose of a Watchdog Timer (WDT) in embedded systems? A) To increase clock speed B) To prevent system hangs by resetting the system C) To store data permanently	I	CO5

	D) To manage external devices		
4C – 11	What kind of reset does the watchdog timer typically generate? A) Power-on reset B) Manual reset C) Hardware reset D) Software reset only	<b>I</b>	<b>CO5</b>
4C – 12	Which of the following is a major approach for designing embedded firmware? A) Object-oriented programming only B) Layered design C) Random coding D) Manual hardware routing	<b>I</b>	<b>CO5</b>
4C – 13	Layered firmware design helps mainly in: A) Decreasing system cost B) Improving code modularity and maintainability C) Increasing hardware dependency D) Making code harder to debug	<b>II</b>	<b>CO5</b>
4C – 14	Which of the following languages is most commonly used for embedded firmware development? A) Python B) Java C) C D) HTML	<b>III</b>	<b>CO5</b>
4C – 15	Which modern language is gaining popularity in embedded firmware for its safety features like memory protection? A) Python B) Rust C) Java D) Bash	<b>III</b>	<b>CO5</b>

**FILL IN THE BLANKS**

4F – 1	A reset circuit ensures that the microcontroller starts operation from a known _____.	<b>II</b>	<b>CO5</b>
4F – 2	_____ capacitors are often used in hardware reset circuits to introduce a delay.	<b>II</b>	<b>CO5</b>
4F – 3	Reset circuits are crucial to recover from _____ failures in embedded devices.	<b>I</b>	<b>CO5</b>
4F – 4	Brown-out protection ensures the system operates safely when the _____ voltage drops.	<b>II</b>	<b>CO5</b>
4F – 5	Brown-out resets usually require a small amount of additional _____ to detect voltage drop accurately.	<b>II</b>	<b>CO5</b>
4F – 6	An oscillator provides the _____ clock signal to the microcontroller.	<b>I</b>	<b>CO5</b>
4F – 7	A _____ crystal is commonly used for high-precision oscillator circuits.	<b>II</b>	<b>CO5</b>
4F – 8	A real-time clock (RTC) is used to keep track of _____ and date.	<b>I</b>	<b>CO5</b>
4F – 9	RTCs typically run on a separate low-frequency _____.	<b>II</b>	<b>CO5</b>
4F – 10	A watchdog timer (WDT) is used to detect and recover from _____ faults.	<b>IV</b>	<b>CO5</b>
4F – 11	The process of resetting the WDT is often called "_____ the watchdog."	<b>I</b>	<b>CO5</b>
4F – 12	Watchdog timers can operate even when the CPU is in low-_____ modes.	<b>I</b>	<b>CO5</b>
4F – 13	_____ architecture organizes firmware as independent tasks or threads that may run concurrently.	<b>I</b>	<b>CO5</b>
4F – 14	In a _____ architecture, the firmware is divided into layers like hardware abstraction, middleware, and application.	<b>II</b>	<b>CO5</b>
4F – 15	_____ is the most widely used language in embedded systems due to its efficiency and direct hardware access.	<b>III</b>	<b>CO5</b>

**MATCH THE FOLLOWING**

4M – 1	1. Reset Circuit 2. Watchdog Timer 3. Brown-Out Reset 4. Oscillator unit	A. Reset the system if it hangs B. Provide timing and clock signals C. To initialize the system to a known state D. Reset due to low supply voltage	II	CO5
4M – 2	1. Oscillator frequency 2. Real Time Clock 3. Hardware reset 4. Feeding or kicking	A. watchdog timer typically generate B. determines execution speed of instructions C. Resetting WDT countdown timer to prevent timeout D. keep track of the current time and date	I	CO5
4M - 3	1. Layered design 2. Super Loop design 3. RTOS-based design 4. RTC with an alarm feature	A. Executes tasks sequentially in a continuous loop B. Better task management and scheduling C. Waking the system up from sleep mode D. major approach for designing embedded firmware	II	CO5
4M – 4	1. Hardware Abstraction Layer (HAL) 2. Super Loop design 3. Reset vector 4. Software Reset software	A. It can be triggered by writing to a special register B. first code that executes after a reset C. Difficult to scale for complex applications D. Make hardware independent from higher-level	IV	CO5
4M – 5	1. Crystal oscillators 2. Internal oscillators 3. modular programming 4. Brown-out protection active	A. For low-cost or low-power applications B. Power-up, power-down, and low-voltage fluctuations C. provide high accuracy and stability D. Breaking code into independent, reusable modules	III	CO5

**5 – MARKS QUESTIONS**

4D – 1	Illustrate the role of reset circuit in embedded system.	II	CO5
4D – 2	Justify the need of brown out protection circuit in Embedded systems.	V	CO5
4D – 3	Examine the role of Watch dog Timer and oscillator unit in embedded system.	IV	CO5
4D – 4	Summarize the role of real time clock in embedded system.	II	CO5
4D – 5	Outline the following i) Brownout protection circuit ii) Real Time Clock.	II	CO5
4D – 6	Interpret the following terms (i) Oscillator unit (ii) Watch Dog Timer	II	CO5
4D – 7	Explain the role of Brown out protection circuit in embedded system.	V	CO5
4D – 8	What is embedded firmware? List the different approaches available for embedded firmware development?	IV	CO5
4D – 9	Make use of a neat diagram to discuss the following terms in Embedded System. a) Watch dog Timer. b) Real Time Clock.	III	CO5
4D – 10	Discuss the significance of Watchdog timer in an Embedded System.	VI	CO5
4D – 11	Illustrate the concept of watch dog timer.	II	CO5
4D – 12	Explain the embedded firmware design.	II	CO5
4D – 13	Explain the role of firmware in an embedded system's boot process.	V	CO5
4D – 14	What is the need of an embedded firmware? Demonstrate the embedded firmware development languages.	II	CO5
4D – 15	Explain the advantages, disadvantages and limitations of assembly language based embedded firmware development.	II	CO5

**UNIT – V**

**RTOS BASED EMBEDDED SYSTEM DESIGN**

<b>SL.NO</b>	<b>MULTIPLE CHOICE QUESTIONS</b>	<b>BT</b>	<b>Cours</b>
		<b>Leve</b>	

		el	Outcome
5C - 1	<p>What does RTOS stand for?</p> <p>A) Real Time Operating Software            B) Real Time Operating System            C) Rapid Transfer Operating System            D) Random Time Operating System</p>	II	CO6
5C - 2	<p>What is the main goal of an RTOS in embedded systems?</p> <p>A) To minimize memory usage            B) To maximize system uptime            C) To ensure predictable and timely task execution            D) To reduce processor clock speed</p>	II	CO6
5C - 3	<p>Which type of operating system ensures that tasks are completed within strict timing constraints?</p> <p>A) Batch Operating System            B) Time-Sharing Operating System            C) Real-Time Operating System            D) Distributed Operating System</p>	I	CO6
5C - 4	<p>An Embedded Operating System is characterized by:</p> <p>A) High memory usage and resource wastage            B) Lightweight, fast, and task-specific operation            C) Handling multiple users over a network            D) Acting as a central server</p>	II	CO6
5C - 5	<p>In RTOS terminology, what is a "task"?</p> <p>A) A hardware component            B) A background process            C) A unit of execution managed by the RTOS scheduler            D) A communication protocol</p>	II	CO6
5C - 6	<p>In RTOS, what is the main difference between a process and a thread?</p> <p>A) Processes are lightweight; threads are heavyweight            B) Threads share the same memory space; processes have separate memory spaces            C) Processes are faster than threads            D) Threads cannot communicate with each other</p>	I	CO6
5C - 7	<p>In RTOS, a thread is often also called:</p> <p>A) Kernel            B) Fiber            C) Task            D) Heap</p>	II	CO6
5C - 8	<p>In embedded RTOS design, when would you choose to use processes instead of threads?</p> <p>A) When you need faster execution            B) When you need better protection and fault isolation            C) When you need simple data sharing            D) When you want minimum overhead</p>	I	CO6
5C - 9	<p>In a multitasking RTOS system, a process can have:</p> <p>A) Only one thread            B) No threads at all            C) One or more threads            D) Unlimited processes inside a thread</p>	II	CO6
5C - 10	<p>Multiprocessing refers to:</p> <p>A) Multiple tasks on a single CPU            B) Multiple CPUs executing multiple tasks            C) Single core execution with faster clock</p>	IV	CO6

	D) Rebooting multiple devices		
5C - 11	In multiprocessing systems, what challenge often arises? A) No need for synchronization B) Complexity in task communication and resource sharing C) Task memory becomes infinite D) Single processor overload	I	CO6
5C - 12	What is multitasking in an RTOS? A) Executing multiple processors at once B) Executing multiple tasks by a single CPU seemingly at the same time C) Using two CPUs for one task D) Running only one task at a time	I	CO6
5C - 13	What is a key benefit of multitasking? A) High memory consumption B) Better CPU utilization C) Reduced clock speed D) Increased code complexity	I	CO6
5C - 14	What is task scheduling in an RTOS? A) Allocating memory for tasks B) Deciding which task runs at what time C) Connecting multiple tasks with wires D) Synchronizing clocks	II	CO6
5C - 15	In task scheduling, which of the following is NOT a real task state? A) Running B) Sleeping C) Ready D) Blocked	III	CO6
<b>FILL IN THE BLANKS</b>			
5F - 1	In an RTOS, a _____ is the smallest unit of execution that can be scheduled by the system.	II	CO6
5F - 2	An RTOS usually provides a _____, a special software timer to trigger actions at specific times.	IV	CO6
5F - 3	A _____ operating system is designed to support multitasking without real-time guarantees.	II	CO6
5F - 4	An _____ RTOS is lightweight and designed to run on systems with very limited memory and processing power.	III	CO6
5F - 5	In RTOS, a _____ is the basic unit of execution, similar to a lightweight process.	I	CO6
5F - 6	A task can exist in different states such as Ready, Running, Waiting, and _____.	I	CO6
5F - 7	In some RTOS designs, an _____ task is created to handle system errors or exceptional conditions.	II	CO6
5F - 8	A _____ is an independent program in execution with its own memory space.	II	CO6
5F - 9	A _____ is the smallest unit of execution within a process.	I	CO6
5F - 10	In embedded RTOS systems, _____ are often used instead of full processes to save memory and improve speed.	I	CO6
5F - 11	_____ refers to the ability of a system to use multiple processors or cores to execute tasks simultaneously.	I	CO6
5F - 12	In _____, a single processor executes multiple tasks by switching between them rapidly, creating the illusion of concurrent execution.	I	CO6
5F - 13	In _____ multitasking, tasks are executed sequentially with the OS switching between them based on a fixed time slice.	II	CO6
5F - 14	_____ scheduling is a method where the task with the highest priority is always selected to run first.	III	CO6
5F - 15	In an RTOS, _____ <b>scheduling</b> allocates CPU time in fixed time slices, typically used in systems requiring regular, predictable task execution.	III	CO6
<b>MATCH THE FOLLOWING</b>			

5M - 1	1. In an RTOS, Thread or Task 2. RTOS in embedded systems 3. Semaphore 4. In an RTOS, an ISR	A. Synchronize tasks and manage resource access B. as short and fast as possible C. smallest unit of execution D. To ensure predictable and timely task execution	II	CO6
5M - 2	1. Deadlock occurs when 2. Soft RTOS allows 3. Embedded OS 4. Tiny OS designed for	A. Occasional deadline misses without catastrophic consequences B. Two or more tasks wait indefinitely for each other's resources C. Wireless sensor networks D. Lightweight, fast, and task-specific operation	IV	CO6
5M - 3	1. Running state 2. Threads 3. Stack 4. Multitasking	A. scheduled and managed by the RTOS kernel B. components is unique to each thread C. Better CPU utilization D. valid state of a task in an RTOS	III	CO6
5M - 4	1. Multiprocessing Systems 2. Task Scheduling 3. RTOS Scheduling Algorithm 4. Scheduler in RTOS	A. Deciding which task runs at what time B. Selecting which task executes next based on priority C. Complexity in task communication and resource sharing D. Priority-based Preemptive Scheduling	II	CO6
5M - 5	1. Tick Timer switching 2. Idle task 3. In multitasking RTOS 4. Semaphores and mutexes	A. the CPU switches between tasks by Context B. Schedule tasks periodically C. helps synchronize tasks in RTOS D. No other task is ready to run	I	CO6

**5 – MARKS QUESTIONS**

5D - 1	Why do we need to have user space and kernel space separate? Explain?	II	CO6
5D - 2	On what basis RTOS is going to be chosen? Discuss.	VI	CO6
5D - 3	Explain the different functional and non-functional requirements that need to be evaluated in the selection of an RTOS.	II	CO6
5D - 4	Describe the real time operating systems. Compare its features with window based real time operating systems.	V	CO6
5D - 5	List different types of operating systems.	IV	CO6
5D - 6	Explain task, process and thread with their types and examples which aids the real time system.	V	CO6
5D - 7	What is a process? Make use of a neat representation explain the process states and state transition.	III	CO6
5D - 8	Contrast process and thread. Write some examples.	IV	CO6
5D - 9	Justify the use of a thread in a process.	V	CO6
5D - 10	Demonstrate the various activities involved in the creation of processes and threads.	II	CO6
5D - 11	Compare and Contrast multitasking and multiprocessing?	IV	CO6
5D - 12	Classify the types of multitasking?	II	CO6
5D - 13	Define the term Multitasking. Identify how the multitasking is distinguished with multiprocessing.	III	CO6
5D - 14	What is task scheduling? Summarize the Round Robin scheduling algorithm?	II	CO6
5D - 15	Compare pre-emptive and non-pre-emptive scheduling.	II	CO6

**PREVIOUS YEAR QUESTION PAPER**

**(MODEL PAPER)**

**R22CSE3147 – Embedded Systems**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

**III B.Tech-II Semester–End Examinations (Model paper)**

**Embedded Systems (IT)**

**Duration: 3 Hrs**

**Max Marks: 60 M**

<b>Section – A</b>				
<b>Answer <u>All</u> of the following questions</b>			<b>Marks: 10Qx1M = 10M</b>	
		<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
1	Outline the characteristics of embedded systems?	1	CO1	II
2	Define Embedded Systems?	1	CO1	I
3	Name any four-bit manipulation instructions in microcontroller 8051?	1	CO2	I
4	Classify the addressing modes of 8051 microcontrollers?	1	CO2	IV
5	Demonstrate about the interrupts and its associated usage in ARM processor.	1	CO3	II
6	What is a loading constant in ARM processor?	1	CO4	I
7	Recall the terms i) Real time clock ii) Oscillator Unit	1	CO5	I
8	Interpret the Watchdog timer?	1	CO5	II
9	Compare between a process and thread.	1	CO6	IV
10	Translate how a Real time operating system uniquely different than a general purpose OS?	1	CO6	II

**Section – B**

**Answer any FIVE questions choosing at least one from each Unit**

**Marks: 5Qx10M = 50M**

	<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
<b>UNIT-I</b>			
11. Infer the purpose of Embedded Systems in detail with example. <b>(OR)</b>	10	CO1	II,II
12. Relate the classification of Embedded Systems based on generations?			

<b>UNIT-II</b>				
13. Categorize the addressing modes of 8051 microcontroller? (OR)	14. Identify the data transfer instructions and program control instructions of 8051?	10	CO2	IV,III
<b>UNIT – III</b>				
15. Draw the architectural block diagram of ARM and explain the data flow referring each unit. (OR)	16. Choose the ARM processors and explain the PSR instructions processors with examples	10	CO3, CO4	V,VI
<b>UNIT – IV</b>				
17. Develop the following (i) Reset Circuit (ii)Brown and Protection Circuit? (OR)	18. Examine the importance about development languages for Embedded Systems.	10	CO5	III,IV
<b>UNIT – V</b>				
19. Extend in detail about Task, Process and Threads? (OR)	20. Summarize briefly about Multiprocessing and Multitasking?	10	CO6	II,II

S.NO	Bloom Taxonomy Level	No. Of. Questions	%	Name & Signature of Paper Setter
1	Fundamental Knowledge from level I & II	12	60	
2	Knowledge on application & Analysis from level III & IV	6	30	
3	Critical thinking and ability to design from level V & VI	2	10	

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## COURSE OUTCOMES (CO's)

**Academic Year:** 2024-25

**Class** : III YEAR-II SEM.

**Course Name** : WEB TECHNOLOGIES (R22CSE3257)

At the end of the course, the student will be able to

Course Outcomes	Statements
C314.1	Describe PHP and PHP utilities for server-side scripting. (L2-Understand)
C314.2	Implement the XML program using PARSING METHODS. (L6-Create)
C314.3	Justify Server-side programming with Java SERVLET'S and JSP. (L5-Evaluate)
C314.4	Develop the JSP page and connecting to Data Base. (L6-Create)
C314.5	Discuss about java script with declaration of variables and functions. (L6-Create)

## COURSE ARTICULATION MATRIX

Course Outcomes (COS)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C314.1	3	-	-	-	2	-	-	-	-	-	-	-	-	1	-
C314.2	3	1	1	-	1	-	-	-	-	-	-	-	-	-	-
C314.3	1	1	1	3	2	-	-	-	-	-	-	-	1	2	1
C314.4	1	3	3	1	1	-	-	-	-	-	-	-	1	-	1
C314.5	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-
C314.6	2	1	1	1	3	-	-	-	-	-	-	-	2	2	1
C314	2.17	1.5	1.5	1.67	1.67	-	-	-	-	-	-	-	1.33	1.67	1

# WEB TECHNOLOGIES

# SYLLABUS

## BR22 – B.TECH. – INFORMATION TECHNOLOGY

### SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

L	T	P	C
3	0	0	3

#### Professional Elective – III (R22CSE3246) WEB TECHNOLOGIES

##### Objectives:

- To introduce PHP language for server side scripting
- To introduce XML and processing of XML Data with Java
- To Introduce Server Side Programming with Java Servlets and JSP
- To Introduce Client side scripting with Javascript and AJAX

##### UNIT – I

**Introduction to PHP :** Declaring Variables, data types, arrays, string operators, expressions, control structures, functions, Reading data from web from controls like text boxes, radio buttons, ,lists etc., Handling File Uploads, Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies.

**File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

##### UNIT - II

**XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model, XHTML **Parsing XML Data** – DOM and SAX in java.

##### UNIT – III

**Introduction to Servlets:** Common Gateway Interface (CGI), Lifecycle of a servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

##### UNIT – IV

**Introduction to JSP:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, Implicit objects, Using Beans in JSP pages, Using Cookies and Session for Session tracking, connecting to database in JSP.

##### UNIT – V

**Client side Scripting :** Introduction to Javascript: Javascript Language – declaring variables, scope of variables, functions, evnt handlers (onclick, onsubmit etc.), Document Object Model, Form Validation. Simple AJAX application.

##### TEXT BOOKS:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

##### REFERENCE BOOKS:

1. Web Programming, building internet applications, Chris Bates 2<sup>nd</sup> Edition, Wiley Dreamtech.
2. Java Server Pages – Hans Bergsten, SPD O'Reilly
3. Java Script, D. Flanagan, O'Reilly, SPD
4. Beginning Web Programming- Jon Duckett WROX.
5. Programming world wide web, R.W. Sebesta, Fourth Edition, Pearson
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(Regulation :R22)  
Department of IT

**Sub. Code & Title**

**R22CSE3246 WEB TECHNOLOGIES**

**Academic Year: 2024-25**

**Year/Sem./Section**

**III-II/Section-A**

**Faculty Name & Designation**

**M.SUMANJALI & Assistant Professor**

**LESSONPLAN**

(L1-Remembering L2-Understading L3-Applying L4-Analyzing L5-Evaluation L6-Creating)

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching methodogy	Proposed no of periods	Actual Date of Handled	CO/RBT	
			From	To					
<b>UNIT-I</b>									
<b>I</b>	<b>PHP</b>					<b>19</b>			
1.1	Introduction to PHP: Declaring Variables	T2,R1	383	383	Black Board	1		CO1	
1.2	Data Types	T2,R1	384	384	Black Board	1		CO1	
1.3	Arrays, String Operators	T2,R1	385	393	Black Board	2		CO1	
1.4	Expressions	T2,R1	396	399	Black Board	1		CO1	
1.5	Control Structures	T2,R1	400	404	Black Board	1		CO1	
1.6	Functions	T2,R1	405	406	Black Board	1		CO1	
1.7	Reading data from web form controls like text boxes, radio buttons, lists etc.,	T2,R1	416	417	Black Board	2		CO1	
1.8	Handling File Uploads	T2,R1	416	417	Black Board	1		CO1	
1.9	Connecting to database (MySQL as reference)	T2,R1	411	413	Black Board	1		CO1	
1.10	Executing Simple Queries	T2,R1	411	413	Black Board	1		CO1	
1.11	Handling results	T2,R1	411	413	Black Board	1		CO1	
1.12	Handling sessions and cookies	T2,R1	415	416	Black Board	1		CO1	
1.13	File Handling in PHP: File operations like opening, closing, reading on text and binary files	T2,R1	411	415	Power Point Presentation	2		CO1	
1.14	File Handling in PHP: File operations like writing, appending, deleting etc., on text and binary files	T2,R1	411	415	Power Point Presentation	2		CO1	
1.15	Listing Directories	T2,R1	411	415	Power Point Presentation	1		CO1	
	Review	Signature of the HOD/Coordinator							
<b>UNIT –II</b>									
<b>II</b>	<b>XML</b>					<b>8</b>			
Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
2.1	XML: Introduction to XML	T1	163	170	Black Board	1		CO2	
2.2	Defining XML tags, their attributes and values	T1	171	179	Black Board	2		CO2	
2.3	Document Type Definition	T1	186	210	Black Board	1		CO2	
2.4	XML Schemas	T1	216	221	Black Board	1		CO2	
2.5	Document Object Model	T1	258	260	Power Point Presentation	1		CO2	
2.6	XHTML Parsing XML Data - DOM in java	T1	261	270	Power Point Presentation	1		CO2	
2.7	DOM and SAX in java	T1	271	283	Black Board	1		CO2	
	Review	Signature of the HOD/Coordinator							
<b>UNIT –III</b>									
<b>III</b>	<b>Introduction to servlet</b>					<b>10</b>			
3.1	Introduction to Servlets: CGI	T1	593	593	Black Board	1		CO3	
3.2	Common Gateway Interface (CGI)	T1	593	603	Black Board	1		CO3	
3.3	Lifecycle of a servlet	T1	612	613	Power Point Presentation	1		CO3	
3.4	Deploying a servlet	T1	613	613	Black Board	1		CO3	
3.5	The Servlet API	T1	609	610	Black Board	1		CO3	
3.6	Reading Servlet parameters	T1	618	618	Black Board	1		CO3	
3.7	Reading Initialization Parameters	T1	615	618	Black Board	1		CO3	
3.8	Handling Http Request & Responses	T1	548	549	Power Point Presentation	1		CO3	
3.9	Using Cookies and Sessions	T1	623	624	Black Board	1		CO3	
3.10	Connecting to a database using JDBC	T1	676	677	Black Board	1		CO3	
	Review	Signature of the HOD/Coordinator							

	<b>SRI INDU COLLEGE OF ENGINEERING &amp; TECHNOLOGY</b> (Regulation :R22) Department of IT		
	<b>Sub. Code &amp; Title</b>	<b>R22CSE3246 WEB TECHNOLOGIES</b>	
	<b>Academic Year: 2024-25</b>	<b>Year/Sem./Section</b>	<b>III-II/Section-A</b>
	<b>Faculty Name &amp; Designation</b>	<b>M.SUMANJALI &amp; Assistant Professor</b>	

UNIT-IV								
IV	JSP					11		
4.1	<b>Introduction to JSP</b>	T1	631	631	Black Board	1	CO4	
4.2	The Anatomy of a JSP Page	T1	639	639	Black Board	1	CO4	
4.3	JSP Processing	T1	640	640	Black Board	1	CO4	
4.4	Declarations	T1	647	647	Black Board	1	CO4	
4.5	Directives	T1	640	643	Black Board	1	CO4	
4.6	Expressions	T1	644	644	Black Board	1	CO4	
4.7	Code Snippets	T1	645	645	Power Point Presentation	1	CO4	
4.8	Implicit objects	T1	648	648	Black Board	1	CO4	
4.9	Using Beans in JSP pages	T1	664	667	Power Point Presentation	1	CO4	
4.10	Using Cookies and session for session tracking	T1	668	671	Black Board	1	CO4	
4.11	Connecting to database in JSP	T1	676	676	Black Board	1	CO4	
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						

UNIT-V								
V	XML					10		
5.1	<b>Client side Scripting</b>	T1	383	383	Black Board	1	CO5	
5.2	Introduction to JavaScript	T1	383	389	Black Board	1	CO5	
5.3	JavaScript Language - declaring variables	T1	390	390	Black Board	1	CO5	
5.4	Scope of Variables	T1	390	390	Black Board	1	CO5	
5.5	Functions	T1	391	391	Black Board	1	CO5	
5.6	Event handlers (onclick, insubmit etc.,)	T1	463	477	Power Point Presentation	2	CO5	
5.7	Document Object Model	T1	482	496	Power Point Presentation	1	CO5	
5.8	Form Validation	T1	505	517	Black Board	1	CO5	
5.9	Simple AJAX application	T1	542	550	Black Board	1	CO5	
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						

### TEXT BOOKS:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

### REFERENCE BOOKS:

1. Web Programming, building internet applications, Chris Bates 2nd Edition, Wiley Dreamtech.
2. Java Server Pages – Hans Bergsten, SPD O'Reilly
3. Java Script, D. Flanagan, O'Reilly, SPD
4. Beginning Web Programming- Jon Duckett WROX.
5. Programming world wide web, R.W. Sebesta, Fourth Edition, Pearson
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson

## Web Links:

W1: <https://www.geeksforgeeks.org/dsa/control-structures-in-programming-languages/>

W2: [https://www.tutorialspoint.com/javascript/javascript\\_data\\_types.htm](https://www.tutorialspoint.com/javascript/javascript_data_types.htm)

W3: <https://www.geeksforgeeks.org/java/life-cycle-of-a-servlet/>

W4: <https://archive.nptel.ac.in/courses/106/105/106105084/>

W5: <https://archive.nptel.ac.in/courses/106/105/106105084/>

<b>SELF STUDY TOPICS</b>			
S.NO	TOPICS	BOOKS & JOURNALS	COURSE OUTCOMES
1.	HTML BASICS	WEB TECHNOLOGIES - Uttam K Roy	CO-1

	<b>SRI INDU COLLEGE OF ENGINEERING &amp; TECHNOLOGY</b>			
	(Regulation :R22)			
	Department of IT			
	Sub. Code & Title	R22CSE3246 WEB TECHNOLOGIES		
	Academic Year: 2024-25	Year/Sem./Section	III-II/Section-A	
Faculty Name & Designation		M.SUMANJALI & Assistant Professor		

## ASSIGNMENT – I

Batch No.	Assignment Questions	Course outcome	BT Level	Register Number
	<b>SET-1</b>			
1	Explain about arrays in PHP with an example?	L2	CO1	<b>22D41A2201 To 22D41A2205</b>
2	Explain String functions in PHP?	L3	CO1	
3	Write about XML tags, attributes and values with an example?	L2	CO2	
4	Explain about Document Object Model with an example?	L1	CO2	
5	Explain how Cookies are used for Session Tracking?	L2	CO3	
	<b>SET-II</b>			
1	Design a PHP program to create, insert, update and delete a table using MySQL?	L2	CO1	<b>22D41A2206 To 22D41A2210</b>
2	Develop a PHP program to read content from one file and write them in another file?	L4	CO1	
3	Differentiate DOM and SAX parser?	L1	CO2	
4	Write about building blocks of XML document?	L4	CO2	
5	Define Session Tracking? Explain different Session Tracking mechanisms?	L2	CO3	
	<b>SET-III</b>			
1	Explain PHP form processing with an example?	L1	CO1	<b>22D41A2211 To 22D41A2215</b>
2	Demonstrate the control structures in PHP with an example?	L1	CO1	
3	Write about XML tags, attributes and values with an example?	L2	CO2	
4	Explain about Document Object Model with an example?	L2	CO2	
5	Define Servlet? Explain Servlet Life Cycle with an example?	L2	CO3	

	<b>SET-IV</b>			
1	Explain handling file uploads with an example?	L2	CO1	<b>22D41A2216 To 22D41A2220</b>
2	Describe the listing directories in PHP?	L6	CO1	
3	Write a XML program for internal DTD and external DTD?	L1	CO2	
4	Define target Namespace? Explain XML schema and its elements and attributes?	L3	CO2	
5	Explain about Servlet parameters in Generic Servlet with an example?	L2	CO3	
	<b>SET-V</b>			
1	Explain PHP form processing with an example?	L3	CO1	<b>22D41A2221 To 22D41A2225</b>
2	Explain String functions in PHP?	L6	CO1	
3	Create a program for parsing XML data using DOM parser in java?	L4	CO2	
4	Create a program for parsing XML data using SAX parser in java?	L3	C O 2	
5	Explain about Servlet parameters in Generic Servlet with an example?	L2	CO3	
	<b>SET-VI</b>			
1	Discuss different file modes in PHP with an example?	L3	CO1	<b>22D41A2226 To 22D41A2230</b>
2	Explain about arrays in PHP with an example?	L2	CO1	
3	Differentiate DOM and SAX parser?	L2	C O 2	
4	Write about building blocks of XML document?	L2	C O 2	
5	Explain how Cookies are used for Session Tracking?	L2	CO3	
	<b>SET-VII</b>			
1	Explain handling file uploads with an example?	L3	CO1	<b>22D41A2231 To 22D41A2235</b>
2	Describe the listing directories in PHP?	L2	CO1	
3	Create a program for parsing XML data using DOM parser in java?	L2	C O 2	
4	Create a program for parsing XML data using SAX parser in java?	L3	CO2	
5	List out the steps for deploying Servlet in tomcat web server?			
	<b>SET-VIII</b>			
1	Explain PHP form processing with an example?	L2	CO1	

2	Explain String functions in PHP?	L2	CO1	<b>22D41A2236 To 22D41A2240</b>
3	Explain the important features of XML over HTML?	L3	CO2	
4	Write a XML program for internal DTD and external DTD?	L3	CO2	
5	Define Servlet? Explain Servlet Life Cycle with an example?	L2	CO3	
	<b>SET-IX</b>			
1	Design a PHP program to create, insert, update and delete a table using MySQL?	L2	CO1	<b>22D41A2241 To 22D41A2245</b>
2	Develop a PHP program to read content from one file and write them in another file?	L3	CO1	
3	Write a XML program for employee information using Document Type Definition (DTD)?	L2	CO2	
4	Differentiate DOM and SAX parser?	L1	CO2	
5	Explain about Servlet parameters in Generic Servlet with an example?	L2	CO3	
	<b>SET-X</b>			
1	Explain about arrays in PHP with an example?	L2	CO1	<b>22D41A2246 To 22D41A2250</b>
2	Discuss different file modes in PHP with an example?	L4	CO1	
3	Differentiate DOM and SAX parser?	L1	CO2	
4	Write about building blocks of XML document?	L4	CO2	
5	Define Session Tracking? Explain different Session Tracking mechanisms?	L2	CO3	
	<b>SET-XI</b>			
1	Explain handling file uploads with an example?	L1	CO1	<b>22D41A2251 To 22D41A2255</b>
2	Describe the listing directories in PHP?	L1	CO1	
3	Create a program for parsing XML data using DOM parser in java?	L2	CO2	
4	Create a program for parsing XML data using SAX parser in java?	L2	CO2	
5	List out the steps for deploying Servlet in tomcat web server?	L2	CO3	
	<b>SET-XII</b>			
1	Explain PHP form processing with an example?	L2	CO1	<b>22D41A2256 To 23D41A2260</b>
2	Demonstrate the control structures in PHP with an example?	L6	CO1	
3	Write about XML tags, attributes and values with an example?	L1	CO2	
4	Explain about Document Object Model with an example?	L3	CO2	
5	Define Servlet? Explain Servlet Life Cycle with an example?	L2	CO3	

	<b>SET-XIII</b>			
1	Explain handling file uploads with an example?	L1	CO1	<b>22D41A2261</b> <b>To</b> <b>23D41A220</b> <b>(LATERAL )</b>
2	Describe the listing directories in PHP?	L1	CO1	
3	Write a XML program for internal DTD and external DTD?	L2	CO2	
4	Define target Namespace? Explain XML schema and its elements and attributes?	L2	CO2	
5	Explain about Servlet parameters in Generic Servlet with an example?	L2	CO3	
	<b>SET-XIV</b>			
1	Explain PHP form processing with an example?	L1	CO1	<b>23D41A2204</b> <b>To</b> <b>23D41A2206</b> <b>(LATERAL )</b>
2	Demonstrate the control structures in PHP with an example?	L1	CO1	
3	Write about XML tags, attributes and values with an example?	L2	CO2	
4	Explain about Document Object Model with an example?	L2	CO2	
5	Define Servlet? Explain Servlet Life Cycle with an example?	L2	CO3	

**ASSIGNMENT – II**

<b>Batch No.</b>	<b>Assignment Questions</b>	<b>Course outcome</b>	<b>BT Level</b>	<b>Register Number</b>
	<b>SET-1</b>			
1.	Explain various control statements in JavaScript?	L2	C324.3	

2.	Write the steps to connecting to database in JSP?	L6	C324.4	<b>22D41A2201</b> <b>To</b>
3.	Differentiate doGet() and doPost() methods in HttpServlet?	L4	C324.4	
4.	Define control statements in JavaScript?	L1	C324.5	<b>22D41A2205</b>
5.	List out the window object methods? Explain the advantages of AJAX?	L1	C324.5	
	<b>SET-II</b>			
1.	Explain different types of datatypes in JavaScript?	L2	C324.3	<b>22D41A2206</b> <b>To</b>
2.	Develop a User validation web application using JSP?	L5	C324.4	
3.	Create a program for inserting user credentials into database using Servlet through JDBC?	L2	C324.4	<b>22D41A2210</b>
4.	Explain how to embedded javascript code in HTML document?	L4	C324.5	
5.	Define how to create Date Object? List out the window object methods?	L6	C324.5	
	<b>SET-III</b>			
1.	Explain various control statements in JavaScript?	L1	C324.3	<b>22D41A2211</b> <b>To</b> <b>22D41A2215</b>
2.	Illustrate the usage of Cookies and Session for Session tracking?	L1	C324.4	
3.	Explain how to handling HttpRequest and HttpResponse with an example?	L2	C324.4	
4.	Distinguish JSP and Servlets?	L2	C324.5	
5.	Write about MIME types?	L2	C324.5	
	<b>SET-IV</b>			
1.	Explain different types of JavaScript objects?	L2	C324.3	<b>22D41A2216</b> <b>To</b> <b>22D41A2220</b>
2.	Explain JSP application design with MVC architecture?	L2	C324.4	
3.	Explain how to handling HttpRequest and HttpResponse with an example?	L2	C324.4	
4.	Explain about string objects in JavaScript? List out the window object methods?	L2	C324.5	
5.	Define Arrays in JavaScript?	L1	C324.5	
	<b>SET-V</b>			
1.	Define a variable in JavaScript and explain the scope of variable with an example?	L1	C324.3	<b>22D41A2221</b> <b>To</b> <b>22D41A2225</b>
2.	Explain the advantages of JavaBean component in JSP?	L2	C324.4	
3.	Explain the advantages of reading initialization parameters with an example?	L2	C324.4	
4.	List out the JSP tags? Define the Beans in JSP?	L1	C324.5	
5.	Describe Session Tracking?	L1	C324.5	
	<b>SET-VI</b>			
1.	Design a JavaScript program for validation page to verify phone	L6	C324.3	

	number and email id?			<b>22D41A2226</b>
2.	Explain about JSP Scripting tags and Directive tags?	L2	C324.4	<b>To</b>
3.	Explain the advantages of reading initialization parameters with an example?	L2	C324.4	<b>22D41A2230</b>
4.	Explain about various implicit object in JSP? Explain about JSP expression tag?	L2	C324.5	
5.	List out the JSP tags? Explain about JSP directive tags?	L1	C324.5	
	<b>SET-VII</b>			
1.	Define an Event? How to handle events in JavaScript?	L1	C324.3	
2.	Explain JSP Processing?	L2	C324.4	<b>22D41A2231</b>
3.	Explain how Cookies are used for Session Tracking?	L2	C324.4	<b>To</b>
4.	Create a jsp page to display current date and time?	L6	C324.5	<b>22D41A2235</b>
5.	Distinguish JSP and Servlets?	L4	C324.5	
	<b>SET-VIII</b>			
1.	Explain different types of JavaScript objects?	L2	C324.3	
2.	Explain JSP application design with MVC architecture?	L2	C324.4	<b>22D41A2236</b>
3.	Explain how to handling HttpRequest and HttpResponse with an example?	L2	C324.4	<b>To</b>
4.	Explain about string objects in JavaScript? List out the window object methods?	L2	C324.5	<b>22D41A2240</b>
5.	Define Arrays in JavaScript?	L1	C324.5	
	<b>SET-IX</b>	L2	C324.3	
1.	Explain various control statements in JavaScript?	L2	C324.3	
2.	Write the steps to connecting to database in JSP?	L6	C324.4	<b>22D41A2241</b>
3.	Differentiate doGet() and doPost() methods in HttpServlet?	L4	C324.4	<b>To</b>
4.	Explain about string objects in JavaScript? List out the window object methods?	L2	C324.5	<b>22D41A2245</b>
5.	Define Arrays in JavaScript?	L1	C324.5	
	<b>SET-X</b>			
1.	What is JavaScript? List out the features of JavaScript?	L1	C324.3	
2.	Explain about Anatomy of JSP page?	L2	C324.4	<b>22D41A2246</b>
3.	Explain the advantages of reading initialization parameters with an example?	L2	C324.4	<b>To</b>
4.	List out the JSP tags? Explain about scriptlet tag?	L1	C324.5	<b>22D41A2250</b>
5.	Distinguish JSP and Servlets?	L4	C324.5	
	<b>SET-XI</b>			
1.	Design a simple AJAX application using JavaScript?	L6	C324.3	
2.	Discuss different Action Tags used in JSP in detail?	L4	C324.4	

3.	Explain how to handling HttpRequest and HttpResponse with an example?	L2	C324.4	<b>22D41A2251</b> <b>To</b> <b>22D41A2255</b>
4.	Write about MIME types?	L6	C324.5	
5.	List different types of statements in JDBC?	L1	C324.5	
	<b>SET-XII</b>			
1.	Explain various control statements in JavaScript?	L1	C324.3	<b>22D41A2256</b> <b>To</b> <b>23D41A2260</b>
2.	Write the steps to connecting to database in JSP?	L2	C324.4	
3.	Create a program for inserting user credentials into database using Servlet through JDBC?	L2	C324.4	
4.	Create a jsp page to display current date and time?	L6	C324.5	
5.	Distinguish JSP and Servlets?	L4	C324.5	
	<b>SET-XIII</b>			
1.	Explain different types of JavaScript objects?	L2	C324.3	<b>22D41A2261</b> <b>To</b> <b>23D41A220</b>
2.	Explain JSP application design with MVC architecture?	L2	C324.4	
3.	Explain how to handling HttpRequest and HttpResponse with an example?	L2	C324.4	
4.	Differentiate Generic Servlet and HttpServlet?	L1	C324.5	<b>LATERAL</b>
5.	List different types of statements in JDBC? Write about MIME types?	L4	C324.5	
	<b>SET-XIV</b>			
1.	Explain various control statements in JavaScript?	L2	C324.3	<b>23D41A2204</b> <b>To</b> <b>23D41A2206</b> <b>LATERAL</b>
2.	Write the steps to connecting to database in JSP?	L6	C324.4	
3.	Differentiate doGet() and doPost() methods in HttpServlet?	L4	C324.4	
4.	Explain about string objects in JavaScript? List out the window object methods?	L2	C324.5	
5.	Define Arrays in JavaScript?	L1	C324.5	



# QUESTION BANK

## QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 6. Creating)

UNIT-1 : INTRODUCTION			
	Multiple choice Questions	BT Level	Course Outcome
1C-1	<b>Which of the following is the correct way to declare a variable in PHP?</b> a) \$variable = 10; b) variable = 10; c) var \$variable = 10; d) int \$variable = 10;	L1	CO1

1C-2	<b>Which of the following is not a valid data type in PHP?</b> a) Integer b) String c) Boolean d) Double Precision	L1	CO1
1C-3	<b>How do you access an element of an associative array in PHP?</b> a) \$array[0] b) \$array['key'] c) \$array.key d) \$array->key	L1	CO1
1C-4	<b>How do you define a function in PHP?</b> a) function myFunction() { } b) def myFunction() { } c) func myFunction() { } d) create function myFunction() { }	L1	CO1
1C-5	<b>Which PHP superglobal variable is used to collect data from an HTML form using the GET method?</b> A) \$_POST B) \$_REQUEST C) \$_GET D) \$_FORM	L1	CO1
1C-6	<b>How can you connect to a MySQL database in PHP?</b> A) mysql_connect('localhost', 'username', 'password'); B) mysqli_connect('localhost', 'username', 'password'); C) pdo_connect('localhost', 'username', 'password'); D) All of the above	L3	CO1
1C-7	<b>Which function is used to open a file in PHP?</b> A) open_file() B) fopen() C) file_open() D) open()	L3	CO1
1C-8	<b>Which function is used to delete a file in PHP?</b> A) unlink() B) delete() C) remove() D) delete_file()	L4	CO1
1C-9	<b>How do you start a session in PHP?</b> A) session_start(); B) start_session(); C) initialize_session(); D) session_open();	L1	CO1

1C-10	<b>Which superglobal variable is used to handle session data in PHP?</b> A) \$_SESSION B) \$_COOKIE C) \$_REQUEST D) \$_SERVER	L1	CO1
1C-11	<b>Which function is used to set a cookie in PHP?</b> A) set_cookie() B) cookie() C) setcookie() D) create_cookie()	L3	CO1
1C-12	<b>Which PHP function is used to close a file that was previously opened?</b> A) close() B) fclose() C) end() D) file_close()	L1	CO1
1C-13	<b>Which of the following is used to iterate over an associative array in PHP?</b> A) foreach(\$array as \$key => \$value) B) for(\$key in \$array) C) while(\$array as \$key => \$value) D) array_foreach(\$array)	L1	CO1
1C-14	<b>Which function can you use to get the size of a file in PHP?</b> A) get_size() B) filesize() C) file_length() D) get_filesize()	L1	CO1
1C-15	<b>Which function is used to retrieve a cookie's value in PHP?</b> A) get_cookie() B) cookie_value() C) \$_COOKIE['cookie_name'] D) retrieve_cookie()	L3	CO1
1F- 1	In PHP, a variable starts with the _____ symbol.	L1	CO1
1F-2	The PHP data type used for storing a sequence of characters is called _____.	L2	CO1
1F-3	The operator used for concatenating strings in PHP is _____.	L2	CO1
1F-4	To get data from a form field with the GET method, you would use the superglobal _____.	L2	CO1
1F-5	To open a file in read mode, you use the function _____.	L2	CO1
1F-6	When a file is opened for reading, the function _____ is used to close the file.	L1	CO1
1F-7	To start a session in PHP, the function you use is _____.	L1	CO1
1F-8	To set a cookie in PHP, you use the function _____.	L1	CO1
1F-9	The \$_FILES superglobal is used to handle data from _____ fields.	L1	CO1

1F-10	The PHP function used to retrieve the current session ID is _____.	L2	CO1
1F-11	The function _____ is used to check if a file has been uploaded successfully.	L3	CO1
1F-12	To create a new directory in PHP, the function used is _____.	L3	CO1
1F-13	To declare an array in PHP, you can use the _____ keyword or use the shorthand [] syntax.	L2	CO1
1F-14	The function _____ is used to retrieve data from an HTML form when the form is submitted via the POST method.	L1	CO1
1F-15	The PHP function used to retrieve the current session ID is _____.	L1	CO1

Match the following

1M-1	<ul style="list-style-type: none"> <li>a. PHP</li> <li>b. HTML</li> <li>c. Indexed array</li> <li>d. Server side scripting</li> </ul>	<ul style="list-style-type: none"> <li>1. Numeric</li> <li>2. PHP</li> <li>3. Client side scripting</li> <li>4. Hyper text preprocessor</li> </ul>	L1	CO1
1M-2	<ul style="list-style-type: none"> <li>a. PHP Object</li> <li>b. Session</li> <li>c. Cookies</li> <li>d. a</li> </ul>	<ul style="list-style-type: none"> <li>1. File for writing only</li> <li>2. Instance of class</li> <li>3. Client side scripting</li> <li>4. Server side scripting</li> </ul>	L1	CO1

**5-MARKS QUESTIONS**

1D-1.	Explain about arrays in PHP with an example? (Understanding)	L2	CO1
1D-2.	Explain PHP form processing with an example? (Understanding)	L2	CO1
1D-3.	Demonstrate the control structures in PHP with an example? (Applying)	L3	CO1
1D-4.	Explain String functions in PHP? (Understanding)	L2	CO1
1D-5.	Discuss different file modes in PHP with an example? (Understanding)	L3	CO1
1D-6.	Explain handling file uploads with an example? (Understanding)	L2	CO1
1D-7.	Describe the listing directories in PHP? (Understanding)	L2	CO1
1D-8	Explain various data types in PHP in details? (Understanding)	L2	CO1
1D-9	Design a PHP program to create, insert, update and delete a table using MySQL? (Creating)	L6	CO1
1D-10	Develop a PHP program to read content from one file and write them in another file? (Creating)	L6	CO1
1D-11	Difference between Get and post methods.	L3	CO1
1D-12	Write a HTML program on Table creation.	L3	CO1

**UNIT-II: XML**

<b>Multiple choice Questions</b>		<b>BT Level</b>	<b>Course Outcome</b>
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2C-1	<p><b>What does XML stand for?</b></p> <p>A) Extensible Markup Language  B) Exquisite Markup Language  C) Extended Markup Language  D) Enhanced Markup Language</p>	L1	CO2
2C-2	<p><b>Which of the following is a key feature of XML?</b></p> <p>A) It is used to define the structure of web pages.  B) It can be customized to define new tags.  C) It only supports static content.  D) It is a programming language.</p>	L1	CO2
2C-3	<p><b>Which of the following is a valid XML tag?</b></p> <p>A) &lt;tag value="example"&gt;  B) &lt;tag value="example"&gt;content&lt;/tag&gt;  C) &lt;tag&gt;&lt;value="example"&gt;content&lt;/value&gt;&lt;/tag&gt;  D) &lt;&lt;tag&gt;&gt;content&lt;/tag&gt;</p>	L1	CO2
2C-4	<p><b>In XML, attributes are used to:</b></p> <p>A) Define new elements  B) Specify properties of elements  C) Structure the XML document  D) Define rules for XML schema</p>	L1	CO2
2C-5	<p><b>What is the purpose of a Document Type Definition (DTD) in XML?</b></p> <p>A) To define the structure of an XML document  B) To transform XML data into HTML  C) To define the user interface of an XML document  D) To define XML tags and their styles</p>	L3	CO2
2C-6	<p><b>Which of the following is true about DTD?</b></p> <p>A) DTD defines data types for XML tags.  B) DTD is used to define the rules and structure of an XML document.  C) DTD is a programming language.  D) DTD is only used in HTML documents.</p>	L1	CO2
2C-7	<p><b>Which of the following is a feature of XML Schema (XSD)?</b></p> <p>A) XML Schema defines the structure and data types of XML documents  B) XML Schema can only define the structure of HTML documents.  C) XML Schema is limited to only validating tags.  D) XML Schema is a programming language for parsing XML .</p>	L1	CO2
2C-8	<p><b>What does the &lt;xs:simpleType&gt; element in an XML Schema define?</b></p> <p>A) It defines the attributes of a complex type  B) It defines the basic data types for elements (e.g., string, integer).  C) It specifies the XML document structure.  D) It is used for defining metadata in XML documents.</p>	L4	CO2

2C-9	<b>What is the primary purpose of the Document Object Model (DOM) in XML?</b> A) It stores data in a key-value pair format. B) It is used to query and modify XML documents programmatically. C) It is used to define the XML document structure. D) It is used to transform XML data into HTML.	L3	CO2
2C-10	<b>Which of the following methods is used to read XML documents using DOM in Java?</b> A) DocumentBuilderFactory.newInstance() B) DocumentBuilder.newDocument() C) XMLReader.parse() D) SAXParserFactory.createParser()	L1	CO2
2C-11	<b>Which of the following is the correct syntax to link a DTD to an XML document?</b> A) <!DOCTYPE book SYSTEM "book.dtd"> B) <DOCTYPE book SYSTEM "book.dtd"> C) <?DOCTYPE book SYSTEM "book.dtd"?> D) <DOCTYPE book "book.dtd">	L3	CO2
2C-12	<b>How is XHTML different from XML?</b> A) XHTML is a stricter version of HTML, which follows XML syntax rules B) XHTML is the same as XML C) XHTML is used only for vector graphics D) XHTML cannot be parsed by a DOM parser	L1	CO2
2C-13	<b>Which of the following is a key advantage of SAX parsing over DOM parsing?</b> A) SAX stores the entire document in memory, while DOM does not B) SAX is faster and uses less memory for large XML documents C) DOM is better suited for sequential parsing D) SAX supports more data types than DOM	L6	CO2
2C-14	<b>What is the DOM in XML?</b> A) representation of an XML document as a tree structure B) A method of styling XML documents C) A technique for transforming XML documents D) A type of markup language	L3	CO2
2C-15	<b>Which of the following methods is used to parse an XML document using SAX in Java?</b> A) parseDocument() B) parse() C) readXML() D) handleXML()	L5	CO2
<b>FILL IN THE BLANKS</b>			
2F-1	XML stands for _____ Markup Language.	L1	CO2
2F-2	An _____ is a name-value pair that provides additional information about an element in an XML document.	L2	CO2
2F-3	A _____ is a set of rules that defines the structure and legal elements and attributes for an XML document.	L3	CO2
2F-4	The _____ API provides a way to interact with an XML document as a tree structure, where each node represents a part of the document.	L2	CO2

2F-5	_____ is a set of rules used to convert an XML document into a valid XHTML document, adhering to the syntax and structure requirements of HTML.	L1	CO2
2F-6	The _____ parser reads the entire XML document into memory and provides a tree structure for easy access, whereas the _____ parser reads the document sequentially and is more memory efficient.	L2	CO2
2F-7	In XML, the _____ tag defines the beginning of an element, and the _____ tag defines the end of that element.	L1	CO2
2F-8	An attribute in XML is always specified within the _____ tag and is written in the form of a name-value pair.	L3	CO2
2F-9	To define a DTD for an XML document, it can either be embedded within the XML file itself or be referenced from an _____ file.	L1	CO2
2F-10	In DOM, each element, attribute, and piece of text is represented as a _____, which can be manipulated through the API.	L1	CO2
2F-11	In Java, the _____ parser is event-driven and provides a faster way of reading XML documents because it does not load the entire document into memory.	L1	CO2
2F-12	In XML, a tag is always enclosed within _____ brackets.	L2	CO2
2F-13	In a DTD, the _____ keyword is used to define the allowed elements and their structure.	L1	CO2
2F-14	To declare an entity that will be referenced multiple times in an XML document, you would use the _____ declaration, followed by the entity's name and value.	L2	CO2
2F-15	When using the _____ parser, the data is represented as a sequence of events (e.g., startElement, endElement), which can be handled using event handler methods.	L3	CO2
<b>Match the following</b>			
2M-1	<ul style="list-style-type: none"> <li>a. IBM</li> <li>b. HTML</li> <li>c. XML</li> <li>d. W3 SCHOOLS</li> </ul>	<ul style="list-style-type: none"> <li>1. Pre defined tags</li> <li>2. GML</li> <li>3. User defined tags</li> <li>4. SGML</li> </ul>	L3 CO2
2M-2	<ul style="list-style-type: none"> <li>a. Document Type Definition (DTD)</li> <li>b. PC data</li> <li>c. XML Schemas</li> <li>d. XML</li> </ul>	<ul style="list-style-type: none"> <li>1. Used for validating and defining the structure and data types in XML.</li> <li>2. user can write their own tags</li> <li>3. parsed character data</li> <li>4. Defines the structure, elements, and attributes of an XML document.</li> </ul>	L5 CO2
<b>5-MARKS QUESTIONS</b>			
2D-1.	Write about XML tags, attributes and values with an example? (Applying)	L3	CO2
2D-2.	Explain about Document Object Model with an example? (Understanding)	L2	CO2
2D-3.	Create a program for parsing XML data using DOM parser in java? (Creating)	L6	CO2
2D-4.	Create a program for parsing XML data using SAX parser in java? (Creating)	L 6	CO2
2D-5.	Write a XML program for employee information using Document Type Definition	L3	CO2

	(DTD)? (Applying)		
2D-6.	Differentiate DOM and SAX parser? (Analyzing)	L4	CO2
2D-7	Write about building blocks of XML document? (Applying)	L3	CO2
2D-8	Explain the important features of XML over HTML? (Understanding)	L2	CO2
2D-9	Write a XML program for internal DTD and external DTD?(Applying)	L3	CO2
2D-10	Define targetNamespace? Explain XML schema and its elements and attributes? (Understanding)	L2	CO2
2D-11	A) Explain the various terms related to Document Type Definition. B) Define XML? What are the advantages of xml?	L2	CO2

### UNIT-III INTRODUCTION TO SERVLETS

#### Multiple choice Questions

		BT Level	Course Outcome
3C-1	<b>What is the primary difference between CGI and Servlets?</b> A. Servlets are executed by a web server, while CGI processes run as separate programs. B. CGI is faster than Servlets. C. Servlets require manual configuration, while CGI does not. D. There is no difference between CGI and Servlets.	L1	CO3
3C-2	<b>Which of the following methods is NOT part of the servlet lifecycle?</b> A. init() B. service() C. destroy() D. validate()	L1	CO3
3C-3	<b>Where should a servlet be placed to be accessible to a web server?</b> A. In the WEB-INF/classes directory B. In the public_html folder C. In the Servlets directory D. In the root directory of the server	L1	CO3
3C-4	<b>Which package contains the core classes and interfaces for servlets?</b> A. java.servlet B. javax.servlet C. org.apache.servlet D. java.servletapi	L1	CO3

3C-5	<b>How can servlet parameters be retrieved in a servlet?</b> A. Using request.getParameter() B. Using response.getParameter() C. Using request.getAttribute() D. Using response.getAttribute()	L1	CO3
3C-6	<b>How do you read initialization parameters in a servlet?</b> A. Using getInitParameter(). B. Using getParameter(). C. Using getAttribute(). D. Using getServletContext().	L1	CO3
3C-7	<b>Which method is used to send a response to the client in a servlet?</b> A. response.sendRedirect() B. response.getWriter() C. response.write() D. response.render()	L1	CO3
3C-8	<b>Which of the following is used to maintain session information between client and server in servlets?</b> A. Cookies B. URL rewriting C. Both A and B D. None of the above	L1	CO3
3C-9	<b>Which of the following is true about CGI?</b> A. CGI creates a new process for every client request B. CGI creates only one process for all client requests C. CGI can process requests asynchronously D. CGI is faster than servlets	L1	CO3
3C-10	<b>Which of the following methods is called when a servlet is first created?</b> A. destroy() B. init() C. service() D. load()	L1	CO3
3C-11	<b>What does the service() method in a servlet do?</b> A. Initializes the servlet B. Handles incoming requests and sends responses C. Closes the servlet D. Loads the servlet configuration	L1	CO3
3C-12	<b>What file is typically used to configure servlets in a web application?</b> A. web.xml B. servlet.xml C. config.xml D. deploy.xml	L1	CO3
3C-13	<b>In which section of the web.xml file are servlets configured?</b> A. <servlet> B. <context> C. <listener> D. <filter>	L1	CO3
3C-14	<b>Which package provides the servlet classes and interfaces?</b> A. java.servlet	L1	CO3

	B. javax.servlet C. org.apache.servlet D. servlet.api		
3C-15	<b>Which interface does a servlet filter implement?</b> A. Filter B. ServletFilter C. ServletContext D. FilterChain	L1	CO3
<b>FILL IN THE BLANKS</b>			
3F-1	The <b>Common Gateway Interface (CGI)</b> is a standard that defines how information is passed between the _____ and web servers.	L1	CO3
3F-2	The <b>init()</b> method is called once during the lifecycle of a servlet, typically to _____ resources such as database connections or configuration settings.	L1	CO3
3F-3	The <b>destroy()</b> method is called before the servlet is _____.	L2	CO3
3F-4	A _____ file (web descriptor) is used for configuring servlets, defining servlet mappings, and handling other application settings.	L1	CO3
3F-5	The Servlet API provides two key interfaces for handling HTTP requests and responses: <b>HttpServletRequest</b> and _____.	L3	CO3
3F-6	The _____ interface allows servlets to interact with the server's HTTP requests and send responses back to the client.	L6	CO3
3F-7	Servlet parameters, such as those sent through <b>GET</b> or <b>POST</b> methods, can be retrieved using the _____ method of the <b>HttpServletRequest</b> class.	L3	CO3
3F-8	A _____ is used to store small amounts of data on the client's computer, such as user preferences or authentication information.	L2	CO3
3F-9	To create a session object in a servlet, the <b>getSession()</b> method of the _____ object is used.	L1	CO3
3F-10	<b>JDBC (Java Database Connectivity)</b> is an API that allows Java applications to connect to a _____ to retrieve or manipulate data.	L4	CO3
3F-11	The _____ class is used in JDBC to establish a connection to a database.	L3	CO3
3F-12	The _____ method is invoked when the servlet container shuts down or when the servlet is about to be removed from the container.	L2	CO3
3F-13	The <b>getParameter()</b> method in <b>HttpServletRequest</b> returns the _____ of the specified parameter, or null if the parameter does not exist.	L1	CO3
3F-14	_____ are parameters sent by the client in the form of a URL query string or HTTP request body, often used for passing data in GET and POST methods.	L3	CO3
3F-15	In a servlet, _____ is used to retrieve the current session for the user, or create a new one if it doesn't exist.	L1	CO3
<b>Match the following</b>			
3M-1	a. init b. Sevice() c. destroy d. Request dispatch response	1. Handles HTTP requests and sends a response 2. Initializes the servelt before Handling requests . 3. Closes Resources before unloading the servlet. 4. Forward or includes another resource in a	L4 CO3
3M -2	a. Class.forName () b. getConnection() c. Create statement()	1. Excutes SQL queries on the database 2. loads the database driver 3. Establishes a connection to the databse.	L3 CO3

	d. Execute Query	4. creates an SQL statement object		
<b>5 - MARKS QUESTIONS</b>				
3D-1.	Define Servlet? Explain Servlet Life Cycle with an example? (Understanding)		L2	CO3
3D-2.	List out the steps for deploying Servlet in tomcat web server? (Remembering)		L2	CO3
3D-3.	Explain about Servlet parameters in Generic Servlet with an example? (Understanding)		L2	CO3
3D-4.	Explain how Cookies are used for Session Tracking? (Understanding)		L2	CO3
3D-5.	Define Session Tracking? Explain different Session Tracking mechanisms? (Understanding)		L2	CO3
3D-6.	Explain the advantages of reading initialization parameters with an example? (Understanding)		L2	CO3
3D-7.	Explain how to handling Http Request and Http Response with an example? (Understanding)		L2	CO3
3D-8	Create a program for inserting user credentials into database using Servlet through JDBC? (Creating)		L6	CO3
3D-9	Differentiate doGet() and doPost() methods in HttpServlet? (Analyzing)		L4	CO3
3D-10	Explain different types of JDBC drivers?		L2	CO3
3D-11	Explain about Servlet API? (Understanding)		L2	CO3
3D-12	Difference between Servlets and applets?		L3	CO3

#### UNIT-IV INTRODUCTION TO JSP

##### Multiple choice Questions

		BT Level	Course Outcome
4C-1	What is the correct order of components in a typical JSP page? a) Declarations, Expressions, Directives, Code Snippets b) Directives, Declarations, Expressions, Code Snippets c) Code Snippets, Directives, Declarations, Expressions d) Directives, Code Snippets, Expressions, Declarations	L1	CO4
4C-2	What happens when a JSP page is first requested by a client? a) The JSP file is compiled directly into a Servlet. b) The JSP file is directly executed without any compilation. c) The JSP page sends a response without processing. d) The JSP page is compiled into a database.	L1	CO4

4C-3	<p>What is the syntax for declaring a variable in a JSP page?</p> <p>a) <code>&lt;%! type variable = value; %&gt;</code></p> <p>b) <code>&lt;%= type variable; %&gt;</code></p> <p>c) <code>&lt;%! type variable; %&gt;</code></p> <p>d) <code>&lt;%! type variable; = value %&gt;</code></p>	L1	CO4
4C-4	<p>Which of the following is true about a declaration in a JSP page?</p> <p>a)Declarations are used to display output.</p> <p>b) Declarations define variables and methods that can be used throughout the JSP page</p> <p>c) Declarations are written within the <code>&lt;%= %&gt;</code> tags.</p> <p>d) Declarations can only be used in scriptlets</p>	L1	CO4
4C-5	<p>What is the correct syntax for declaring a method inside a JSP page?</p> <p>a) <code>&lt;%! public void method() { } %&gt;</code></p> <p>b) <code>&lt;%! void method() { } %&gt;</code></p> <p>c) <code>&lt;% public void method() { } %&gt;</code></p> <p>d) <code>&lt;% void method() { } %&gt;</code></p>	L1	CO4
4C-6	<p>What is the primary purpose of a JSP directive?</p> <p>a)To control the behaviour of the page, such as importing classes.</p> <p>b) To execute logic in the JSP file.</p> <p>c) To display data dynamically.</p> <p>d) To define a custom tag library.</p>	L1	CO4
4C-7	<p>What does an expression in JSP do?</p> <p>a) It evaluates the expression and inserts the result directly into the response output.</p> <p>b) It declares variables</p> <p>c) It includes another JSP page.</p> <p>d) It writes Java code to the page.</p>	L1	CO4
4C-8	<p>What is the syntax for writing an expression in JSP?</p> <p>a) <code>&lt;%= expression %&gt;</code></p>	L1	CO4

	<p>b) &lt;% @ expression="expression" %&gt;</p> <p>c) &lt;% expression %&gt;</p> <p>d) &lt;%# expression %&gt;</p>		
4C-9	<p>What is the purpose of a script let in JSP?</p> <p>a) To execute Java code during page processing.</p> <p>b) To declare variables.</p> <p>c) To include external files.</p> <p>d) To define custom tags.</p>	L1	CO4
4C-10	<p>Which of the following is NOT an implicit object in JSP?</p> <p>a) Request</p> <p>b) response</p> <p>c) session</p> <p>d) bean</p>	L1	CO4
4C-11	<p>What does the &lt;jsp:setProperty&gt; tag do?</p> <p>a) It Gets the property of a JavaBean.</p> <p>b) It Sets the property of a JavaBean.</p> <p>c) It defines a JavaBean.</p> <p>d) It includes an external JavaBean.</p>	L3	CO4
4C-12	<p>Which of the following is the correct way to set a cookie in JSP?</p> <p>a) response.setCookie(cookie)</p> <p>b) response.addCookie(cookie)</p> <p>c) cookie.set(response)</p> <p>d) cookie.setCookie(response)</p>	L1	CO4
4C-13	<p>Which of the following is the correct way to get a database connection using JDBC in a JSP page?</p> <p>a) Connection conn = DriverManager.getConnection(url, username, password)</p> <p>b) Connection conn = DataSource.getConnection()</p>	L1	CO4

	<p>c) Connection conn = new Connection(url)</p> <p>d) Both A and B</p>		
4C-14	<p>What is the primary purpose of JSTL?</p> <p>a) To provide a set of standard actions for Java-based web applications.</p> <p>b) To handle database connections in JSP.</p> <p>c) To manage user sessions.</p> <p>d) To include third-party Java libraries.</p>	L1	CO4
4C-15	<p>What is the correct way to handle errors in a JSP page?</p> <p>a) &lt;%@ page errorFile="error.jsp" %&gt;</p> <p>b) &lt;%@ page exceptionPage="error.jsp" %&gt;</p> <p>c) &lt;%@ page errorPage="error.jsp" %&gt;</p> <p>d) &lt;%@ page handleError="error.jsp" %&gt;</p>	L1	CO4
<b>FILL IN THE BLANKS</b>			
4F-1	A JSP file typically has the extension _____.	L4	CO4
4F-2	A JSP page is translated into a _____ class by the JSP engine.	L1	CO4
4F-3	After a JSP page is compiled into a servlet, the server processes it to generate _____.	L3	CO4
4F-4	The lifecycle of a JSP page includes initialization, execution, and _____.	L1	CO4
4F-5	The syntax for declaring a variable in JSP is _____.	L2	CO4
4F-6	The _____ directive in JSP is used to provide information about the JSP page to the container.	L6	CO4
4F-7	The syntax for an expression in JSP is _____.	L3	CO4
4F-8	A code snippet in JSP is written using the _____ tag.	L2	CO4
4F-9	The implicit object _____ provides access to the request information such as parameters and attributes.	L1	CO4
4F-10	To set a property of a bean in JSP, you use the _____ tag.	L4	CO4
4F-11	The _____ attribute in the <jsp:useBean /> tag specifies the scope of the bean.	L2	CO4
4F-12	The _____ implicit object gives the current HTTP response and allows writing the response.	L1	CO4
4F-13	_____ is used for tracking user sessions in a JSP page.	L4	CO4
4F-14	A _____ is created when the user first visits a JSP page and allows tracking	L3	CO4

	the user over multiple requests.		
4F-15	To establish a database connection, you use the _____ method of Driver Manager.	L1	CO4
<b>Match the following</b>			
4M-1	e. Scriptlet error pages f. Declaration g. Expression scope h. Page directive	1. Defines page attributes like session tracking and 2. evaluates and displays a value in the response 3. Declares variables and methods with class-wide 4. Executes java code inside a Jsp page	L4    CO4
4M-2	e. Request f. session g. response submission h. out to the client	1. used to send output to the client 2. stores user data across multiple pages 3. handles incoming data from a form 4. modifies HTTP responses before sending	L3    CO4
<b>5 - MARKS QUESTIONS</b>			
4D-1.	Explain about Anatomy of JSP page? (Understanding)	L2	CO4
4D-2.	Define JSP? Differentiate JSP and Servlet? (Understanding)	L1	CO4
4D-3.	Explain JSP Processing? (Understanding)	L2	CO4
4D-4.	Explain about JSP Scripting tags and Directive tags? (Understanding)	L2	CO4
4D-5.	Explain the advantage of JavaBean component in JSP? (Understanding)	L2	CO4
4D-6.	Explain JSP application design with MVC architecture? (Understanding)	L2	CO4
4D-7.	Illustrate the usage of Cookies and Session for Session tracking? (Applying)	L3	CO4
4D-8	Develop a User validation web application using JSP? (Creating)	L5	CO4
4D-9	Write the steps to connecting to database in JSP? (Creating)	L1	CO4
4D-10	Discuss different Action Tags used in JSP in detail? (Understanding)	L3	CO4
4D-11	Explain how to load the drivers?	L2	CO4
4D-12	Explain about the JSP Directive Elements? Explain each one of them in detail?	L2	CO4
<b>UNIT-V CLIENT SIDE SCRIPTING</b>			
	<b>Multiple choice Questions</b>	<b>BT Level</b>	<b>Course Outcome</b>
5c-1	Which keyword is used to declare a variable in JavaScript?  a) var b) let c) const	L1	CO5

	d) All of the above		
5c-2	<p>What is the default scope of a variable declared with var inside a function?</p> <p>a) Global scope b) Local scope c) Block scope d) Function scope</p>	L1	CO5
5c-3	<p>Which of the following is true about the const keyword in JavaScript?</p> <p>a) It is used to declare variables that can be reassigned. b) It is used to declare variables whose values cannot be reassigned. c) It cannot be used in a loop. d) It must be declared without initialization.</p>	L1	CO5
5c-4	<p>Which of the following is the correct syntax for declaring a function in JavaScript?</p> <p>a) function myFunction() { } b) myFunction() function { } c) function = myFunction() { } d) func myFunction() { }</p>	L1	CO5
5c-5	<p>Which event handler is triggered when a user clicks on a form submit button?</p> <p>a) onLoad() b) onSubmit() c) onChange() d) onClick()</p>	L1	CO5
5c-6	<p>What is the purpose of the submit event handler in JavaScript?</p> <p>a) To perform an action when a button is clicked b) To validate a form c) To submit the form data to a server d) To execute a JavaScript function when the form is submitted</p>	L1	CO5
5c-7	<p>What does the following JavaScript code do?</p> <pre>document.getElementById("submitBtn").onclick = function() {   alert("Button clicked!"); }</pre> <p>a) It alerts when the page loads b) It assigns a click event handler to the submit button c) It submits the form d) It logs a message to the console</p>	L1	CO5
5c-8	<p>What is the purpose of the Document Object Model (DOM) in JavaScript?</p> <p>a) To handle events in JavaScript b) To represent HTML documents as objects c) To define variables in JavaScript</p>	L1	CO5

	d) To control the CSS styling of a page		
5c-9	Which JavaScript method is used to retrieve the value of an input field? a) input.value() b) input.getValue() c) input.value d) input.innerHTML	L1	CO5
5c-10	How do you access an element with the id "myDiv" in JavaScript? a) document.getElementById("myDiv") b) document.querySelector("#myDiv") c) document.getElementById("myDiv").value d) Both A and B	L3	CO5
5c-11	What is the purpose of AJAX in web development? a) To validate user input b) To asynchronously request data from a server and update parts of the web page c) To manage JavaScript variables d) To send form data synchronously	L1	CO5
5c-12	Which JavaScript method is used to submit a form using AJAX? a) xhr.send() b) xhr.post() c) xhr.fetch() d) xhr.request()	L1	CO5
5c-13	What does the XMLHttpRequest object do in AJAX? a) It handles XML file parsing b) It sends asynchronous HTTP requests to the server c) It validates form data d) It modifies the content of an HTML page	L1	CO5
5c-14	Which of the following is an example of an asynchronous JavaScript request? a) fetch() b) alert() c) console.log() d) add Event Listener()	L1	CO5
5c-15	Which of the following is the correct syntax for making an AJAX request using the XMLHttpRequest object? a) xhr.open("GET", "url", true); xhr.send(); b) xhr.send("GET", "url", true); c) xhr.open("POST", "url"); xhr.send("data"); d) xhr.get("url", true); xhr.send();	L1	CO5
<b>FILL IN THE BLANKS</b>			
5F-1	In JavaScript, variables can be declared using the keywords _____, _____, or _____.	L4	CO5
5F-2	A _____ is a block of code that is defined once and can be executed when called	L1	CO5

	using its name.		
5F-3	The _____ event handler is used to trigger a function when a user clicks on an HTML element, such as a button.	L4	CO5
5F-4	The _____ event handler is used to trigger a function when a form is submitted.	L1	CO5
5F-5	The _____ provides an interface for manipulating HTML and XML documents by representing the page as a tree of objects.	L3	CO5
5F-6	JavaScript is often used for _____ to ensure that the data entered in a form meets specific criteria before it is submitted to the server.	L6	CO5
5F-7	In a basic AJAX application, the _____ object is used to send requests to the server and receive responses.	L3	CO5
5F-8	In an AJAX request, the _____ method is commonly used to send data to a server asynchronously.	L2	CO5
5F-9	The _____ method in JavaScript is used to select an HTML element by its id.	L1	CO5
5F-10	A JavaScript function can check if a field is _____ before submitting a form.	L4	CO5
5F-11	In an AJAX request, the _____ event is used to handle situations where the request fails (e.g., due to network errors).	L3	CO5
5F-12	The _____ method is used to send the request to the server after the request has been set up using the open() method.	L2	CO5
5F-13	The _____ operator in JavaScript is used to compare two values for equality without considering their type.	L4	CO5
5F-14	The _____ method is used to create a new HTML element dynamically in JavaScript.	L3	CO5
5F-15	In JavaScript, the _____ data type represents a sequence of characters enclosed in either single quotes, double quotes, or backticks.	L1	CO5
<b>Match the following</b>			
5M-1	<ul style="list-style-type: none"> <li>i. Inner HTML</li> <li>j. .Document.getElementById</li> <li>k. For loop</li> <li>l. Math.sqrt()</li> </ul>	<ul style="list-style-type: none"> <li>1. Loops through a block of code a specific number of times</li> <li>2. returns th square root of a number</li> <li>3. Accesses an HTML element by its unique ID</li> <li>4.Retrieves or modifies the content inside an HTML element</li> </ul>	L4 CO5
5M -2	<ul style="list-style-type: none"> <li>i. onClick</li> <li>j. OnChange</li> <li>k. onMouseover</li> <li>l. onSubmit</li> </ul>	<ul style="list-style-type: none"> <li>1. The user moves the mouse over an element</li> <li>2. the user submits a form</li> <li>3. the user clicks on an element</li> <li>4. the value of an input field changes</li> </ul>	L3 CO5
<b>5 - MARKS QUESTIONS</b>			
5D-1.	What is JavaScript? List out the features of JavaScript? (Remembering)	L1	CO5
5D-2.	Explain the need of scripting languages in Web Applications. (Understanding)	L2	CO5
5D-3.	Define an Event? How to handle events in JavaScript? (Remembering)	L1	CO5
5D-4.	Design a JavaScript program for validation page to verify phone number and email id? (Creating)	L6	CO5
5D-5.	Define a variable in JavaScript and explain the scope of variable with an example?	L2	CO5

	(Understanding)		
5D-6.	Explain different types of JavaScript objects? (Understanding)	L2	CO5
5D-7.	a. Write about Document Object Model (DOM) in JavaScript? (Applying) b. Explain about getElementById(), getElementsByTagName()? (Understanding)	L2	CO5
5D-8	Explain different types of datatypes in JavaScript? (Understanding)	L2	CO5
5D-9	Explain various control statements in JavaScript? (Understanding)	L2	CO5
5D-10	Design a simple AJAX application using JavaScript? (Creating)	L6	CO5
5D-11	What is form validation? Explain with example?	L2	CO5
5D-12	Explain briefly about the event handlers?	L2	CO5
5D-13	What is an event? How can we handle events in JavaScript?	L2	CO5

**PREVIOUS YEAR QUESTION PAPER**



BR-22

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY  
III B.Tech - II Semester - I Mid Term Examinations, MARCH - 2025  
(R22CSE3246) WEB TECHNOLOGIES

D4

Duration: 2 Hrs

(For CSE, IT & CSIT)

Max Marks: 30M

Blooms Taxonomy Levels : I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating, and VI-Creating.

Course Outcomes: CO

Dt: 25-03-2025, Day-2 (AN)

SECTION A1: Answer All multiple choice questions. Part - A (10 Marks)

Marks: 10Qx12M = 5M

1. Which of the following is the correct way to declare a variable in PHP?  
 A) \$variable = 10;                      B) variable = 10;  
 C) var \$variable = 10;                D) int \$variable = 10;  
 [ ]                      I                      CO1
2. How do you access an element of an associative array in PHP?  
 A) \$array[0]                      B) \$array['key']                      C) \$array.key                      D) \$array->key  
 [ ]                      I                      CO1
3. Which PHP super global variable is used to collect data from an HTML form using the GET method?  
 A) \$\_POST                      B) \$\_REQUEST                      C) \$\_GET                      D) \$\_FORM  
 [ ]                      I                      CO1
4. Which function is used to set a cookie in PHP?  
 A) set\_cookie()                      B) cookie()                      C) set cookie()                      D) create\_cookie()  
 [ ]                      III                      CO1
5. Which of the following is a key feature of XML?  
 A) It is used to define the structure of web pages.  
 B) It can be customized to define new tags.  
 C) It only supports static content.  
 D) It is a programming language.  
 [ ]                      I                      CO2
6. What is the purpose of a Document Type Definition (DTD) in XML?  
 A) To define the structure of an XML document  
 B) To transform XML data into HTML  
 C) To define the user interface of an XML document  
 D) To define XML tags and their styles  
 [ ]                      III                      CO2
7. Which of the following is a feature of XML Schema ?  
 A) XML Schema defines the structure and data types of XML documents  
 B) XML Schema can only define the structure of HTML documents.  
 C) XML Schema is limited to only validating tags.  
 D) XML Schema is a programming language for parsing XML  
 [ ]                      I                      CO2
8. What is the DOM in XML?  
 A) representation of an XML document as a tree structure  
 B) A method of styling XML documents  
 C) A technique for transforming XML documents  
 D) A type of markup language  
 [ ]                      III                      CO2
9. What is the primary difference between CGI and Servlets?  
 A) Servlets are executed by a web server, while CGI processes run as separate programs.  
 B) CGI is faster than Servlets.  
 C) Servlets require manual configuration, while CGI does not.  
 D) There is no difference between CGI and Servlets.  
 [ ]                      I                      CO3
10. Where should a servlet be placed to be accessible to a web server?  
 A) In the WEB-INF/classes directory  
 B) In the public\_html folder  
 C) In the Servlets directory  
 D) In the root directory of the server  
 [ ]                      I                      CO3

P.T.O

**SECTION A2: Answer All fill in the blank questions.**

Marks: 6Qx1/2M = 3M

11. In PHP, a variable starts with the \_\_\_\_\_ symbol I CO1
12. To get data from a form field with the GET method, you would use the super global \_\_\_\_\_ II CO1
13. The function \_\_\_\_\_ is used to check if a file has been uploaded successfully. III CO1
14. XML stands for \_\_\_\_\_ I CO2
15. The \_\_\_\_\_ parser reads the entire XML document into memory and provides a tree structure for easy access, whereas the \_\_\_\_\_ parser reads the document sequentially and is more memory efficient. I CO2
16. The `init()` method is called once during the lifecycle of a servlet, typically to \_\_\_\_\_ resources such as database connections or configuration settings I CO3

**SECTION A3: Answer All Match the following questions**

Marks: 2Qx1M = 2M

17.

1.	PHP Object	A.	File for writing only		
2.	Session	B.	Client side scripting	I	CO1
3.	Cookies	C.	Instance of class		
4.	a	D.	Server side scripting		

18.

1.	IBM	A.	Predefined tags		
2.	HTML	B.	GML	III	CO2
3.	XML	C.	SGML		
4.	W3 SCHOOLS	D.	User defined tags		

**Part - B (20 Marks)**

Answer any **FOUR** questions.

Marks: 4Qx5M = 20M

19. Explain about arrays in PHP with an example. II CO1
20. Demonstrate the control structures in PHP with an example. III CO1
21. Develop a PHP program to read content from one file and write them in another file. VI CO1
22. Explain about Document Object Model with an example. II CO2
23. Write a XML program for employee information using Document Type Definition. II CO2
24. Define Servlet? Explain Servlet Life Cycle with an example. II CO3

**END PREVIOUS PAPAPERS**

# SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)(Recognized under 2(f) and 12(B) of UGC Act 1956)

## III B.Tech - II Semester - End Examinations (Suppl.) November-2019

### R14CSE1119 - WEB TECHNOLOGIES

(Common to CSE & IT)

**Duration: 3 Hrs**

**03.12.2019**

**Max Marks: 70M**

#### Section - A

Answer **ALL** the following questions

Marks: 5Qx4M = 20M

1. How to read and write file in PHP? Explain with example.
2. What are the rules to be followed while naming XML elements and attributes.
3. What are the advantages of servlets over CGI.
4. Explain the JSP processing with neat sketch.
5. What are the advantages and disadvantages of client side scripting.

#### Section - B

Answer any **FIVE** questions choosing at least one from each Unit. Marks: 5Qx10M = 50M

#### UNIT - I

- 6 a. Write a PHP program to check the number is prime or not.
- b. Explain the PHP session and PHP cookie with an example.

(OR)

- 7 a. Write a PHP program to find whether the given number is a palindrome or not.
- b. Explain how PHP fits with MySQL.

#### UNIT - II

- 8 a. Explain the Document Object Model with an example.
- b. Create XML document to store voter ID, voter name, address and date of birth details. Create a DTD to validate the document.

(OR)

- 9 a. Compare SAX parser with DOM parser.

b. Write XML file to store book information like its name, author, publisher and price for at least two books and also gives the DTD for the same file.

#### UNIT - III

- 10 a. Describe the lifecycle of a servlet.
- b. Write a servlet program to tracks the number of accesses and last access data of a particular web page.

(OR)

- 11 a. Write a servlet program which displays current system date and time.
- b. Explain about the Session Tracking.

#### UNIT - IV

- 12 a. What are the drawbacks of servlet? How can a JSP overcome them?
- b. Develop a JSP to act as a simple search engine with the support of necessary database. Web page will accept the topic name and JSP will be activated by a submit button click. JSP will open relevant page with a set of relevant URLs for that topic.

(OR)

- 13 a. Explain about the anatomy of a JSP page.

b. Develop a JSP to keep track number of users and display a message “you are n<sup>th</sup> visitor” where n is number of user.

### **UNIT-V**

14 a. What is Java Script? How Client side validation is done by Java Script. Write a script program for pattern matching using string object.

b. List seven mouse events in Java Script. Explain mouse move and mouse click with proper example.

**(OR)**

15. a. Write a java script to demonstrate mathematical functions in java script.

b. What are the technologies used in AJAX.

**\*\*\***



# SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)(Recognized under 2(f) and 12(B) of UGC Act 1956)

## III B.Tech - II Semester - End Examinations (Regular/Suppl.) Nov/Dec-2020

### R16CSE1119 – WEB TECHNOLOGIES

(Common to CSE & IT)

Duration: 2 Hrs

02.12.2020 (AN)

Max Marks: 70M

#### Section - A

Answer any **THREE** the following questions

Marks: 3Qx6M = 18M

1. What is PHP? What is the difference between \$name and \$\$name?
2. What is XML Schema? Explain the advantages of Schema over DTD?
3. What is servlet? Justify how “Servlet offer several advantages over CGI”?
4. Explain how cookies are used for session tracking?
5. Write about the following with reference to JavaScript.
  - a) Functions
  - b) Form Validation

#### Section - B

Answer **FOUR** questions from the following

Marks: 4Qx13M = 52M

#### UNIT-I

6. a) With an example explain the casting of data types in PHP.
- b) Explain the process of reading data from web form controls like text boxes, radio buttons and lists.

(OR)

7. a) Discuss different types of Conditional statements in PHP.
- b) Write a PHP program to demonstrate the passing a variable by reference.

#### UNIT-II

8. a) Explain document structure description with example code in XML.
- b) Explain with an example, how can you check an XML document is both valid and well formed document.

(OR)

9. a) What is DOM? Draw the detailed DOM objects structure. Explain its usage.
- b) Explain SAX parser? Compare and contrast SAX and DOM in java?

#### UNIT-III

10. What are the requirements for CGI process? List and explain the web servers that support CGI programming.

(OR)

11. Write about Security Issues in Servlet. Build a Servlet that handles HTTP get Request.

#### UNIT-IV

1. What about the JSP processing? Explain the mechanism to include resources dynamically and to forward request to other JSPs.

(OR)

13. a) Provide an example for JSP expression.

- b) Describe various steps that are needed for accessing a database from a JSP page.

#### UNIT-V

14. a) Explain the Simple AJAX application.
- b) Discuss the event handlers in JavaScript.

(OR)

15. a) Justify the need of JavaScript in Web Technologies.
- b) Build a Java Script to convert height from centimetres to inches and vice-versa.

\*\*\*

Subject Code: R18CSE3104

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(An Autonomous Institution under UGC, New Delhi)(Recognized under 2(f) and 12(B) of UGC Act 1956)

**III B.Tech - I Semester (REGULAR) - End Examinations March - 2021****WEB TECHNOLOGIES**

17/03/2021

(Computer Science Engineering)

Day - 4 (FN)

**Duration: 3 Hrs****Marks: 5Qx14M = 70M****Answer FIVE questions (Treat Q.No.11 as a single question).****UNIT-I**

1. Classify and list the data types of PHP programming with suitable examples.

**(OR)**

2. What are 'cookies'? Describe the structure and arguments to the PHP function to set a cookie.

**UNIT-II**

3. State the objectives and limitations of XML schema and DTD. Create an XML schema to describe an employee record for an organization.

**(OR)**

4. How do the SAX methods and properties differ from that of DOM? Enumerate the types of nodes in a DOM document object and discuss in detail any three of them?

**UNIT-III**

5. What are states through which the Java servlets lifecycle undergo? Write an example Java code to create and invoke a servlet from a client's HTML page.

**(OR)**

6. Develop a simple JDBC application for storing and retrieving of information from a database of students of an educational Institution.

**UNIT-IV**

7. Classify and explain the elements of JSP with sample codes.

**(OR)**

8. What is the use of cookies in webpages? Illustrate the creation and reading of a cookie in JSP webpage.

**UNIT-V**

9. Explain the integration of JavaScript within an HTML webpage with an example code snippet that prompts the user to enter his/her mobile number and displays an alert message if the number of digits entered is not equal to 10.

**(OR)**

10. Write brief notes on AJAX and tree of objects in DOM for JavaScript.

**11. Answer any THREE questions from the following.****(5M+5M+4M)**

- a. What is meant by 'scope' of a variable? Enumerate its types with examples.
- b. Distinguish between CDATA and PCDATA.
- c. Enumerate the major tasks performed by servlets.
- d. List the types of JSP implicit objects and explain the syntax of any one of these.
- e. Compare and contrast between Java and JavaScript.

**\*\*\***

Write Your Ht.No.

Dr. Ch. Narasimha Lakshay

D4

QC563

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

**III B.Tech. I Semester (REGULAR) End Examinations, January – 2023.**

**(R20CSE3104) WEB TECHNOLOGIES**

**30/01/2023**

**(For CSE, IT and CSIT)**

**Day- 4 (FN)**

**Duration: 3 Hrs**

**Maximum Marks: 70M**

**Blooms Taxonomy : (I-Remembering, II-Understanding, III-Appling, IV-Analyzing, V-Evaluating and VI-Creating)**

**Course Outcomes : CO**

**SECTION-A**

**Answer ALL the following questions.**

**(5Qx 4M = 20M)**

1. What are the primitives supported by PHP? I CO1
2. Differentiate between simple and complex data types in XML. II CO2
3. How to create a cookie using servlet? I CO3
4. What are the difference between JSP and HTML? II CO3
5. What are the different methods by which we can convert a string to a number in JavaScript? II CO4

**SECTION-B**

**Answer FIVE questions choosing at least one from each unit.**

**(5Qx10M =50M)**

**UNIT-I**

6. a) How to do pattern Matching in PHP? IV CO1  
b) Write a PHP script to count the instances of words in string. IV CO1  
OR
7. a) What are the different ways to create array in PHP? Explain with example. III CO1  
b) What is the significance of cookies in web? How can a cookie be created and destroyed in PHP? III CO1

**UNIT-II**

8. Define DTD. What are its applications? Create the HTML document with the paragraph using <p>, <h1>, <strong> for the first word for every sentence and <em> for all the capital letters. II CO2  
OR
9. a) What are the benefits and drawbacks of using XML name space? VI CO2  
b) Create a small XML file designed to contain information about student performance on a module. Each student has a name, roll no, a subject mark and an exam mark. VI CO2

**UNIT-III**

10. a) Explain Life Cycle of a Servlet. II CO3  
b) Develop a Servlet that handles an HTTP POST request. II CO3

OR

P.T.O.

11. a) Write a servlet program to read the name and values of parameters of the client request. III CO3  
 b) What potential advantages do servlets have over CGI programs? Explain. III CO3
- UNIT-IV
12. Justify the differences between servlets and jsp. I CO3  
 OR
13. Explain about the getProperty() and setProperty() of beans in jsp. II CO3
- UNIT-V
14. a) Write a JavaScript program to read an integer value using prompt and display its square. VI CO4  
 b) What is client-side scripting? Write a JavaScript program which accepts N as input and print first N even numbers. VI CO4
- OR
15. a) What is a callback function in JavaScript? State how it is different from normal functions? IV CO4  
 b) Explain Document Object Model with suitable examples and code. IV CO4

\*\*\*\*\*

D4 - AUTONOMOUS



# Academic Calendar 2024-2025

SRI INDU (An COLLEGE AUTONOMOUS INSTITUTION OF ENGINEERING under GC, New Delhi) TECHNOLOGY  
under 2(f) of Act 1936 NBA NAAC Accredited. Approved by AICTE and Permanently affiliated to JNTUH  
Sheriguda Hyderabad - 501 510

BR-22

Lr.No.SICET/AUTO/DAE/111 B.Tech Academic Calendar/85/2024

## B.TECH III-YEAR I-SEM & II-SEM ACADEMIC CALENDAR

(FOR ACADEMIC YEAR : 2024-25)

Academic Calendar for B. Tech — III<sup>rd</sup> Year Students (2022 - 23 Batch), BR-22 Regulation.

### I- Semester

S.No.	EVENT	PERIOD	DURATION
	Commencement of class work.	22.07.2024	Monday
2.	I <sup>st</sup> Spell of Instructions for covering First Two and a half Units. Including CRT training Classes	22.07.2024 - 28.09.2024	10 Weeks
3.	I Mid Term Examinations.	30.09.2024 - 05.10.2024	
4.	Submission of I Mid Term Examination Marks.	09.10.2024	
5.	2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	14.10.2024 - 14.12.2024	9 Weeks
6.	II Mid Term Examinations.	16.12.2024 - 18.12.2024	3 Days
7.	Preparation Holidays and Practical Examinations	19.12.2024 - 28.12.2024	1 Week 3 Days
8.	Submission of II Mid Term Examination Marks.	27.12.2024	
9.	I Semester End Examinations.	30.12.2024 - 18.01.2025	3 Weeks
Commencement of Class-Work for III B. Tech - 11 Semester 20.01.2025 Monday			

Note: No of Working/instructional days : 99

### II- Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	20.01.2025	
2.	I <sup>st</sup> Spell of Instructions for covering First Two and a half Units.	20.01.2025 - 22.03.2025	9 Weeks
3.	I Mid Term Examinations.	24.03.2025 - 26.03.2025	
4.	Submission of I Mid Term Examination Marks.	02.04.2025	
5.	2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	27.03.2025 - 10.05.2025	6 Weeks 3 Days
6.	Summer Vacation	12.05.2025 - 24.05.2025	2 Weeks
7.	Continuation of 2 <sup>nd</sup> Spell of Instructions for Remaining Two and a half Units.	26.05.2025 - 11.06.2025	2 Weeks 3
8.	II Mid Term Examinations.	12.06.2025 - 14.06.2025	
9.	Preparation Holidays and Practical Examinations	16.06.2025 - 21.06.2025	1 Week
10.	Submission of II Mid Term Examination Marks.	19.06.2025	
11.	II Semester End Examinations	23.06.2025 - 05.07.2025	2 Weeks
12.	Commencement of Class-Work for IV B.Tech - I Semester	07.07.2025	

Note: No of Working/instructional days : 98

ACE

Controller of Examination

Sri Indu College of Engineering & Technology  
(An Autonomous Institution Under UGC)

Sri Indu College (An Autonomous institution  
Autonomous Institution Under  
Sheriguda (V), Ibrahimpatnam,  
501510.

TechmbU' Indu College of Engineering & Technology  
Under UGC (An  
UCC)  
R.R. Ibrahimpatnam, R.R. Dist-

Sheriguda Ibrahimpatnam, R.R. Dist-

501510.

Sign:

Dr. M.V.S.S. Giridhar  
Prof. of CEA; JNTUH Nominee

Sign:

Dr. T. Venu Gopal  
Prof. of CSE; JNTUH Nominee

**DIRECTOR**  
of Engineering & Technology

Sign:

Dr. D. Ramesh  
Prof. of CSE; JNTUH Nominee

**PRINCIPAL**  
PRINCIPAL

(Copy to DAP&E and C? oy to all th' Dept. Heads)

# **Information Technology Essentials**

# SYLLABUS

## BR22 – B.TECH. – INFORMATION TECHNOLOGY

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### SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution under UGC, New Delhi)

**B.Tech. - III Year – II Semester**

**OPEN ELECTIVE- I**

L	T	P	C
3	0	0	3

#### (R22INF3235) Information Technology Essentials

**UNIT I: Web Essentials** - Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server – Database Server – HTML basics – HTML tags and their use

**UNIT II: Scripting Essentials** - Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and HTML - Cookies – Sessions - Authentication – Introduction to JavaScript

**UNIT III: Database Essentials** - Database management - Database terms - MySQL - commands – Data types – Indexes – Functions – Accessing MySQL using PHP.

**UNIT IV: Networking Essentials** - Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components

**UNIT V: Application Essentials** - Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

#### **TEXT BOOKS:**

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson, 2012.

#### **REFERENCES:**

1. GottapuSasibhushanaRao, "Mobile Cellular Communication", Pearson, 2012.
2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
**LESSON PLAN**  
**(Regulation :R22)**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**Prepared  
on  
Jan' 2025**

**Sub. Code & Title** | **R22INF3235 - Information Technology Essentials**

**Academic Year: 2024-25** | **Year/Sem.** | **III/II**

**Faculty Name & Designation** | **P.SOJANYA Asst . Professor**

Unit/ Item No.	Topic (s)	Book Referenc e	Page (s)		Teaching Methodolo gy	Propo sed No. of Period s	Actual Date of Handled	CO/RBT
			From	To				
<b>UNIT-I ( Web Essentials )</b>								
1.1	Introduction	T1	3	6	Black Board	01		CO1,RB1
1.2	Creating a Website	T1	18	19	Black Board	01		CO1,RB2
1.3	Working principle of a Website	T1	19	20	Black Board	01		CO1,RB2
1.4	Browser fundamentals	T1	13	16	Black Board	01		CO1,RB2
1.5	Authoring tools	T1	30	33	Black Board	01		CO1,RB2
1.6	Types of servers: Application Server	T1	34	48	Black Board	01		CO1,RB1
1.7	-Web Server	T1	49	52	Black Board	01		CO1,RB2
1.8	Database Server	T1	55	58	Black Board	01		CO1,RB1
1.9	HTML basics	T1	59	64	Black Board	01		CO1,RB2
1.10	HTML tags and their use	T1	65	80	Black Board	02		CO1,RB1
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
**LESSON PLAN**  
**(Regulation :R22)**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**Prepared on**  
**Jan' 2025**

**Sub. Code & Title**                      **R22INF3235 - Information Technology Essentials**

**Academic Year: 2024-25**                      **Year/Sem.**                      **III/II**

**Faculty Name & Designation**                      **P.SOUJANYA Asst . Professor**

Unit/ Item No.	Topic (s)	Book Referenc e	Page (s)		Teaching Methodolo gy	Propose d No. of Periods	Actual Date of Handl ed	CO/RB T
			From	To				
<b>UNIT-II</b> <b>( Scripting Essentials )</b>								
2.1	Need for Scripting languages	T1	81	95	Black Board	01		CO2,RB 2
2.2	Types of scripting languages	T1	96	112	Black Board	02		CO2,RB 5
2.3	Client side scripting	T1	113	130	Black Board	01		CO2,RB 3
2.4	Server side scripting	T1	131	150	Black Board	02		CO2,RB 3
2.5	PHP	T1	151	160	Black Board	01		CO2,RB 2
2.6	Working principle of PHP	T1	161	172	Black Board	01		CO2,RB 1
2.7	PHP Variables – Constants- Operators	T1	173	180	Black Board	01		CO2,RB 4
2.8	Flow Control and Looping	T1	181	190	Black Board	01		CO2,RB 3
2.9	Arrays - Strings - Functions	T1	191	199	Black Board	01		CO2,RB 4
2.10	File Handling	T1	200	205	Black Board	01		CO2,RB 5
2.11	PHP and HTML - Cookies	T1	206	209	Black Board	01		CO2,RB 4
2.12	Sessions - Authentication	T1	210	216	Black Board	01		CO2,RB 4
2.13	Introduction to JavaScript	T1	217	224	Black Board	01		CO2,RB 5
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
**LESSON PLAN**  
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Prepared  
on  
Jan' 2025

**Sub. Code & Title**                      **R22INF3235 - Information Technology Essentials**

**Academic Year: 2024-25**                      **Year/Sem.**                      **III/II**

**Faculty Name & Designation**                      **P.SOUJANYA Asst . Professor**

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodolog y	Propose d No. of Periods	Actual Date of Handle d	CO/RB T
			From	To				
<b>UNIT-III</b> <b>( Database Essentials )</b>								
3.1	Database management	T1	225	227	Black Board	01		CO3,RB1
3.2	Database terms	T1	227	229	Black Board	01		CO3,RB3
3.3	MySQL	T1	231	234	Black Board	01		CO3,RB2
3.4	Commands	T1	234	239	Black Board	01		CO3,RB1
3.5	Data types	T1	239	244	Black Board	02		CO3,RB4
3.6	Indexes	T1	245	252	Black Board	01		CO3,RB1
3.7	Functions	T1	253	279	Black Board	02		CO2,RB2
3.8	Accessing MySQL using PHP	T1	280	316	Black Board	02		CO3,RB2
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						



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			From	To				
<b>UNIT-IV</b> <b>( Networking Essentials )</b>								
4.1	Fundamental computer network concepts	T1	318	320	Black Board	01		CO4,RB2
4.2	Types of computer networks	T1	322	324	Black Board	01		CO4,RB1
4.3	Network layers	T1	324	328	Black Board	01		CO4,RB2
4.4	TCP/IP model	T1	328	337	Black Board	01		CO4,RB2
4.5	Wireless Local Area Network	T1	338	349	Black Board	01		CO4,RB4
4.6	Ethernet	T1	350	361	Black Board	01		CO4,RB2
4.7	WiFi	T1	361	372	Black Board	01		CO4,RB5
4.8	Network Routing	T1	373	380	Black Board	02		CO4,RB3
4.9	Switching	T1	380	387	Black Board	01		CO4,RB3
4.10	Network components	T1	388	398	Black Board	01		CO4,RB3
	<b>Review</b>	<b>Signature of the HOD/Coordinator</b>						

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	<b>Academic Year: 2024-25</b>			<b>Year/Sem.</b>		<b>II/II</b>		
	<b>Faculty Name &amp; Designation</b>			<b>P.SOIJANYA Asst . Professor</b>				
Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
<b>UNIT-V</b> <b>(Application Essentials)</b>								
5.1	Creation of simple interactive applications	T1	399	420	Black Board	01		CO5,RB2
5.2	Simple database applications	T1	421	433	Black Board	01		CO6,RB1
5.3	Multimedia applications	T1	432	444	Black Board	01		CO5,RB3
5.4	Design and development of information systems	T1	451	456	Black Board	02		CO6,RB3
5.5	Personal Information System	T1	461	463	Black Board	01		CO5,RB3
5.6	Information retrieval system	T1	471	478	Black Board	02		CO5,RB4
5.7	Social networking applications	T1	479	482	Black Board	02		CO5,RB2
<b>Review</b>		<b>Signature of the HOD/Coordinator</b>						

### LIST OF TEXT BOOKS AND REFERENCES

#### **TEXT BOOKS:**

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson, 2012.

#### **REFERENCES:**

1. Gottapu SasibhushanaRao, "Mobile Cellular Communication", Pearson, 2012.
2. Ily Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org

#### **Web links**

**W1.**<https://www.geeksforgeeks.org/computer-networks/what-is-server/>

**W2.**<https://www.w3schools.com/php/>

**W3.**<https://www.w3schools.com/MySQL/default.asp>

**W4.**<https://www.geeksforgeeks.org/computer-networks/types-of-computer-networks/>

**W5.**[https://www.tutorialspoint.com/natural\\_language\\_processing/natural\\_language\\_processing\\_information\\_retrieval.html](https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_information_retrieval.html)

## SELF STUDY TOPICS

S.NO	TOPICS	BOOKS & JOURNALS	COURSE OUTCOMES
1.	PHP BASICS	PHP-THE COMPLETE REFERENCE	CO-3

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	<b>Academic Year: 2023-24</b>	<b>Year/Sem.</b>	<b>II/II</b>
	<b>Faculty Name &amp; Designation</b>	<b>P.SOUJANYA Asst . Professor</b>	

## ASSIGNMENT - 1

Q.No.	QUESTIONS	Level	COs	Roll.No.
1	Describe about the functions defined by Web Browser?	II	CO1	01-05
2	Describe the procedure to create a website.?	VI	CO1	
3	Explain about PHP variables?	V	CO2	
4	Evaluate PHP operators and flow controlling?	V	CO2	
5	Write and explain database management ,database terms?	I	CO3	
1	Explain about website and web page with examples?	V	CO1	06-10
2	Discuss about types of servers?	I	CO1	
3	Explain about PHP variables?	I	CO2	
4	Explain about cookies and authentication.?	V	CO2	
5	Describe mysql commands.?	V	CO3	
1	Differentiate website and web-page?.	VI	CO1	11-15
2	Explain about database server and different types of database servers.?	II	CO1	
3	What are the types of scripting languages and explain it.?	VI	CO2	
4	Describe about Arithmetic operators and its operations.?	V	CO2	
5	Differentiate database.* and database.object with example?.	III	CO3	
1	Explain about HTML tags with an example.?	II	CO1	16-20
2	Evaluate HTTP request and HTTP response.?	IV	CO1	
3	Write PHP program to print whether current year is leap year or not.?	II	CO2	
4	Write PHP script to display Fibonacci of length	V	CO2	
5	Explain about accessing MYSQL using PHP .?	V	CO3	
1	Explain the following in brief. A. Domain B. IP Address C. DNS .?	III	CO1	

2	Explain about HTML tags and create table?	II	CO1	21-25
3	Summarize in brief about arrays in PHP with suitable examples.?	II	CO2	
4	What are the benefits of using PHP and MySQL.?	V	CO2	
5	Summarize Various Index in database?	III	CO3	
1	Explain the process of client server communication requests.?	III	CO1	26-30
2	Design a simple web page consists of tables and images.?	V	CO1	
3	Write a PHP code to do string manipulations?	II	CO1	
4	Write PHP script to display the Fibonacci series of length 10.?	V	CO2	
5	Describe detail about Data Types ?	II	CO3	
1	What are Web Essentials? Explain their significance in web development.?	II	CO1	31-35
2	State the following. HTTP cache control and HTTP response?	II	CO1	
3	Explain about types of scripting languages.?	V	CO2	
4	Write and explain PHP working principle?	V	CO2	
5	Write any 20 commands with its functions ?	V	CO3	
1	Describe about the functions defined by Web Browser?	III	CO1	36-40
2	Develop a website which illustrates the significance of “frame” tag?	II	CO1	
3	Analyze the File handling methods and explain with example.?	V	CO2	
4	Describe about Arithmetic operators and its operations in PHP.?	II	CO2	
5	Describe detail about Data Types.in database?	VI	CO3	
1	Explain the following in brief. A. Domain B. IP Address C. DNS ?	VI	CO1	41-45
2	Analyze the importance of authoring tools ?	IV	CO1	
3	Describe PHP and HTML cookies and explain it?	V	CO2	
4	Explain the cookies authentication with program.?	II	CO2	
5	Describe views in DBMS?.	VI	CO3	
1	Compare and contrast Application server and Database server. ?	II	CO1	46-50
2	Explain the following statement. 1. Networking, 2. User Interface?	IV	CO1	
3	Summarize in brief about arrays in PHP with suitable examples ?	V	CO2	
4	Describe about Flow Control and looping and its operations.?	VI	CO2	
5	Explain following Commands  i. UPDATE  ii. DELETE  iii. INSERT INTO  iv. CREATE DATABASE  v. ALTER DATABASE  vi. CREATE TABLE	V	CO3	
1	Explain the following in brief. A. Domain B. IP Address C. DNS ?	VI	CO1	

2	Compare and contrast Application server and Database server. ?	II	CO1	51-55
3	Differentiate between client side scripting and server side scripting	V	CO2	
4	Summarize in brief about arrays in PHP with suitable examples.?	VI	CO2	
5	Explain Data Base Management ?	V	CO3	
1	Explain the process of client server communication requests.?	IV	CO1	56-62
2	State the following. HTTP cache control and HTTP response?	IV	CO1	
3	Define Structured Query language.?	V	CO2	
4	Write a Java-script program to count the number of unique alphabets present in a given string	VI	CO2	
5	Explain the following commands with examples.?  a. SELECT b. SELECT COUNT c.SELECT DISTINCT	II	CO3	
1	Develop a website which illustrates the significance of “frame” tag?	II	CO1	LE-02-LE-06
2	What do you meant by enhancement of Website??	VI	CO1	
3	Explain about javascript.?	V	CO2	
4	Write a PHP code to do string manipulations?.	V	CO2	
5	Analyze the Database Queries.?	V	CO3	

### ASSIGNMENT- II

S.NO.	ASSIGNMENT QUESTIONS	BT Level	Course Outcome	Roll no's
Set-1				
1	What is normalization? what are different types of normalization?	L2	CO3	01-05
2	Briefly discuss about the TCP/IP Protocol?	L1	CO4	
3	Analyze the packet switching in detail?	L3	CO4	
4	Explain the steps for creating simple interactive applications?	L5	CO5	
5	Discuss the characteristics of Information systems?	L2	CO5	
Set-2				
1	Explain about database functions?	L2	CO3	06-10
2	Describe about the WIFI, Ethernet and LAN?	L2	CO4	

3	Draw the IPv4 header format and explain it in detail?	L3	CO4	
4	Discuss the issues of social networking applications?	L4	CO4	
5	Discuss multimedia application?	L2	CO5	
SET-3				
1	Summarize Various Indexes of database?	L3	CO3	11-15
2	Describe the various network topologies in details?	L1	CO4	
3	Differentiate Routing and switching?	L2	CO4	
4	Explain the types of social networking applications?	L2	CO5	
5	List the database applications?	L3	CO5	
SET-4				
1	Explain following Commands a.Update b. delete c. insert into	L2	CO3	16-20
2	Point out the network components available?	L4	CO4	
SET-5				
3	Discuss about the Firewall and modem?	L1	CO4	
4	Write down the features of social networking applications?	L2	CO5	
5	What is information system? Explain the steps involved in design and development of Information Security?	L4	CO5	
SET-5				
1	Define and explain Aggregate Functions?	L1	CO3	21-25
2	Write the differences between packet switching and circuit switching and explain packet switching in detail?	L3	CO4	
3	State the difference between WLAN and WAN?	L2	CO4	
4	Discuss multimedia application?	L2	CO5	
5	What is information system? Explain the steps involved in design and development of Information Security?	L4	CO5	
SET-6				
1	Describe detail about Data Types in database?	L2	CO3	26-30
2	Examine the Transport Layer and Application Layer?	L4	CO4	
3	What are the services provided by DNS server? Explain in detail?	L1	CO4	
4	What is data independence?	L2	CO5	
5	Write down the features of social networking application?	L2	CO5	
SET-7				
1	Explain different types of database management systems?	L1	CO3	31-35
2	Explain the Data link, Physical and Networks Layers in OSI model?	L2	CO4	
3	Describe the various network topologies in details?	L3	CO4	

4	Discuss the issues of social networking applications?	L4	CO5	
5	Explain any three types of data model along with its advantages and disadvantages?	L2	CO5	
SET-8				
1	Explain about database functions?	L2	CO3	36-40
2	Explain packet switching in detail?	L1	CO4	
3	Point out the network components available?	L4	CO4	
4	Write down the features of social networking applications?	L2	CO5	
5	Discuss multimedia application?	L2	CO5	
SET-9				
1	Describe functions in database?	L2	CO3	41-45
2	Explain in detail about Wireless LAN protocols?	L2	CO4	
3	Draw the IPv4 header format and explain it in detail?	L3	CO4	
4	Explain the types of social networking applications?	L1	CO5	
5	Explain the characteristics of Information systems?	L2	CO5	
SET-10				
1	Explain different types of database management systems?	L2	CO3	46-50
2	Explain the Data link, Physical and Networks Layers in OSI model?	L2	CO4	
3	Describe the various network topologies in details?	L3	CO4	
4	Discuss the issues of social networking applications?	L2	CO5	
5	What is an Information Retrieval System? Explain its purpose with advantages and disadvantages?	L4	CO5	
SET-11				
1	Describe detail about Data Types ?	L2	CO3	51-55
2	Examine the Transport Layer and Application Layer?	L2	CO4	
3	What are the services provided by DNS server? Explain in detail?	L1	CO4	
4	What is data independence?	L2	CO5	
5	Write down the features of social networking application?	L2	CO5	
SET-12				
1	Explain about database functions?	L2	CO3	56-60
2	Point out the network components available?	L3	CO4	
3	Explain packet switching in detail?	L1	CO4	
4	What is information system? Explain the steps involved in design and development of Information Security?	L4	CO5	
5	Discuss multimedia application?	L2	CO5	

SET-13				
1	Explain different types of database management systems?	L2	CO3	61-LE-02
2	What are the services provided by DNS server? Explain in detail?	L1	CO4	
3	Examine the Transport Layer and Application Layer?	L5	CO4	
4	Explain the role of event handling in interactive application?	L4	CO5	
5	Explain the characteristics of Information systems?	L2	CO5	
SET-14				
1	Explain following Commands a.Update b. delete c. insert into	L2	CO3	LE-03-LE-06
2	Point out the network components available?	L3	CO4	
3	Discuss about the Firewall and modem?	L1	CO4	
4	Write down the features of social networking applications?	L2	CO5	
5	What is information system? Explain the steps involved in design and development of Information Security?	L4	CO5	

# **QUESTION BANK**



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<b>Faculty Name &amp; Designation</b>	<b>P.SOUJANYA &amp; Asst. Professor</b>
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**QUESTIONBANK WITH BLOOMSTAXONOMYLEVEL (BTL)**

(1.REMEMBERING 2 .UNDERSTANDING3.APPLYING4.ANALYSING5.EVALUATING 6.CREATING)

<b>UNIT-1 WEB ESSENTIALS</b>			
<b>S.no</b>	<b>Multiple choice Questions</b>	<b>BT Level</b>	<b>Course Outcome</b>
1C-1	Which of the following is a key component of a website's front-end?  A) PHP  B) Python  C) HTML  D) MySQL	I	CO1
1C-2	What does CSS stand for?  A) Creative Style System  B) Cascading Style Sheets  C) Computer Style Syntax  D) Custom Styling System	I	CO1

1C-3	<p>Which protocol is used to securely transfer data over the internet?</p> <p>A) FTP</p> <p>B) HTTP</p> <p>C) HTTPS</p> <p>D) SMTP</p>	I	CO1
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1C-4	<p>What is the primary function of JavaScript on a website?</p> <p>A) To style content</p> <p>B) To structure content</p> <p>C) To add interactivity</p> <p>D) To manage databases</p>	I	CO1
1C-5	<p>Which tag is used for adding metadata in an HTML document?</p> <p>A) &lt;meta&gt;</p> <p>B) &lt;head&gt;</p> <p>C) &lt;link&gt;</p> <p>D) &lt;body&gt;</p>	I	CO1
1C-6	<p>What does DNS stand for?</p> <p>A) Digital Network System</p> <p>B) Domain Name System</p> <p>C) Data Node Service</p> <p>D) Dynamic Network Structure</p>	I	CO1
1C-7	<p>Which of the following is NOT a valid DNS record type?</p> <p>A) PTR</p> <p>B) SPF</p> <p>C) HTTP</p> <p>D) SRV</p>	II	CO1

1C-8	<p>What is the purpose of a DNS resolver?</p> <p>A) To send email messages</p> <p>B) To translate IP addresses to domain names</p> <p>C) To query DNS servers and return results to users</p>	IV	CO1
	<p>D) To manage domain registration</p>		
1C-9	<p>Which programming language is commonly used with Apache Tomcat?</p> <p>A) Python</p> <p>B) Java</p> <p>C) PHP</p> <p>D) Ruby</p>	II	CO1
1C-10	<p>What protocol is commonly used by application servers to communicate with web servers?</p> <p>A) FTP</p> <p>B) SMTP</p> <p>C) HTTP/HTTPS</p> <p>D) POP3</p>	II	CO1
1C-11	<p>Which of the following application servers is developed by Red Hat?</p> <p>A) WebLogic</p> <p>B) WildFly</p> <p>C) XAMPP</p> <p>D) IIS</p>	V	CO1
1C-12	<p>Which component is essential for maintaining session data in application servers?</p> <p>A) Load Balancer</p> <p>B) Cache</p> <p>C) Session Manager</p>	III	CO1

	D) Firewall		
1C-13	<p>Which of the following is a popular web server software?</p> <p>A) Apache</p> <p>B) MySQL</p> <p>C) MongoDB</p> <p>D) Postman</p>	I	CO1
1C-14	<p>Which web server is developed by Microsoft?</p> <p>A) Apache Tomcat</p> <p>B) IIS (Internet Information Services)</p> <p>C) Nginx</p> <p>D) Lighttpd</p>	II	CO1
1C-15	<p>What command is commonly used to restart the Apache web server on Linux systems?</p> <p>A) systemctl reload apache</p> <p>B) service apache start</p> <p>C) systemctl restart apache2</p> <p>D) apachectl stop</p>	II	CO1
<b>Fill in the blanks</b>			
1F-1	The <____> tag is used to define the main heading of an HTML document.	I	CO1
1F-2	The <____>tag is used to create a hyperlink in HTML.	I	CO1

1F-3	To define a clickable button in HTML, you use the <_____>tag.	II	CO1
1F-4	A _____ server manages the storage, retrieval, and management of databases.	III	CO1
1F-5	A _____ server is used to manage and control email communication.	I	CO1
1F-6	he _____ server translates domain names into IP addresses for locating web resources.	II	CO1
1F-7	A _____ server is designed to authenticate and manage user permissions in a network.	I	CO1
1F-8	A _____ server helps manage multiple devices in a network by assigning IP addresses dynamically.	II	CO1
1F-9	A _____ server is responsible for delivering web pages to clients over the internet.	III	CO1
1F-10	The language used to add interactivity and dynamic behavior to web pages is _____.	IV	CO1
1F-11	A _____ is a unique address used to access websites on the internet.	I	CO1
1F-12	The HTML attribute used to define inline styles directly within an element is _____.	I	CO1
1F-13	The _____ tag is used to create an unordered list in HTML.	I	CO1
1F-14	The default port number for HTTP is _____.	I	CO1
1F-15	The _____ protocol is used to securely transfer files between a client and a server.	I	CO1
	<b>Match the following</b>		
1M-1	Match the following a) HTML                      (i) Serves web content like HTML, CSS, and images b) Web server                (ii) Defines the structure of web content c) DNS server                (iii) Provides dynamic content handling d) Application server        (iv) Translates domain names to IP addresses	I	CO1

1M -2	Match the following a) Database server (i) Embeds an image into a web page b) <img> (ii) Stores and manages structured data c) <a> (iii) Ensures secure data transmission d) HTTPS (iv) Used to create hyperlinks in HTML	II	CO1
1M -3	Match the following a) Apache Tomcat (i) A Java-based application server developed by Oracle b) WebLogic (ii) An application server widely used for Java Servlets and JSP c) JBoss (WildFly) (iii) An application server known for Java EE support d) GlassFish (iv) An open-source Java EE application server	I	CO1
1M -5	Match the following a) Node.js (i) business logic, application logic, b) Application Server (ii) runtime environment for executing JavaScript on the server side c) Middleware (iii) Microsoft's web and application server for Windows d) IIS (iv) Software that connects client requests to backend services	IV	CO1
1M-5	Match the following a) MySQL (i) An open-source relational database known for web applications b) MongoDB (ii) A NoSQL database that stores data in JSON-like format c) PostgreSQL (iii) An open-source RDBMS known for advanced features and scalability d) SQL Server (iv) A relational database server developed by Microsoft	II	CO1
<b>5 - MARKS QUESTIONS</b>			
1.	Describe about the functions defined by Web Browser?	I	CO1
2.	Difference between APPLICATION server and WEB server?	II	CO1
3.	Discuss about types of servers?	II	CO1
4.	Explain about HTML tags with an example.?	IV	CO1
5.	Evaluate HTTP request and HTTP response.?	V	CO1

6.	Explain the following in brief. A. Domain B. IP Address C. DNS .?	II	CO1
7.	Explain about HTML tags and create table?	II	CO1
8.	Explain the process of client server communication requests.?	II	CO1
9.	Design a simple web page consists of tables and images.?	II	CO1
10.	What are Web Essentials? Explain their significance in web development.?	II	CO1
11.	State the following. HTTP cache control and HTTP response?	II	CO1
12.	Describe about the functions defined by Web Browser?	V	CO1
13.	Describe the procedure to create a website.?	IV	CO1
14.	Evaluate TCP and IP.	III	CO1
15.	Develop a website which illustrates the significance of “frame” tag?	V	CO1

## Unit -II : SCRIPTING ESSENTIALS

### Multiple Choice Questions

2C-1	Which of the following is NOT a scripting language?  A) Python B) JavaScript C) C++ D) Bash	II	CO2
2C-2	Which command is used to display text in Bash?  A) print B) console.log() C) echo D) display	III	CO2
2C-3	In Python, which symbol is used for comments?  A) // B) # C) /* */ D) --	I	CO2
2C-4	What is the output of the following Python code? <code>x = 5 print(x == 5)print(x = 5)</code>  A) True followed by True B) True followed by False C) True followed by an error D) False followed by True	II	CO2
2C-5	In PowerShell, which symbol is used to define a variable?  A) \$ B) @ C) & D) #	I	CO2
2C-6	What will the following JavaScript code output? <code>console.log(type of null);</code> A) null B) object C)undefined D)string	IV	CO2

2C-7	<p>Which file extension is commonly used for Python scripts?</p> <p>A) .bash B) .py C) .sh D) .js</p>	IV	CO2
2C-8	<p>Which symbol is used to start a PHP block of code?</p> <p>A) &lt;script&gt; B) &lt;?php C) &lt;? D) &lt;! ---&gt;</p>	V	CO2
2C-9	<p>Which of the following is a valid way to declare a variable in PHP?</p> <p>A) int x = 5; B) var x = 5; C) \$x = 5; D) x := 5;</p>	VI	CO2
2C-10	<p>Which function is used to output text in PHP?</p> <p>A) echo B) print() C) console.log() D) Both A and B</p>	III	CO2
2C-11	<p>Which of the following is the correct way to include a file in PHP?</p> <p>A) import 'file.php'; B) include('file.php'); C) require_once 'file.php'; D) Both B and C</p>	I	CO2
2C-12	<p>What will this code output?</p> <pre>php CopyEdit \$x = 5;\$y = "5";echo (\$x === \$y) ? "True" : "False";</pre> <p>A) True B) False C) Error D) 5</p>	I	CO2
2C-13	<p>Which function is used to connect to a MySQL database in PHP?</p> <p>A) mysqli_connect() B) mysql_connect() C) db_connect() D) connect_db()</p>	I	CO2

2C-14	What is the correct way to start a session in PHP?  A) session_start(); B) start_session(); C) session(); D) init_session();	V	CO2
2C-15	Which of the following methods is used to retrieve data from a form submitted using the GET method?  A) \$_POST B) \$_SESSION C) \$_REQUEST D) \$_GET	III	CO2
<b>Fill in the blanks</b>			
2F-1	PHP scripts are executed on the _____ side.	I	CO2
2F-2	The correct syntax to start a PHP block is _____.	I	CO2
2F-3	Variables in PHP are declared using the _____ symbol.	II	CO2
2F-4	To print text in PHP, we can use _____ or _____.	I	CO2
2F-5	The function used to connect to a MySQL database is _____.	III	CO2
2F-6	PHP files are saved with the extension _____.	II	CO2
2F-7	The function used to start a new session in PHP is _____.	I	CO2
2F-8	In PHP, the _____ keyword is used to define a constant.	III	CO2
2F-9	To convert a string to lowercase in PHP, we use the function _____.	II	CO2
2F-10	In PHP, the function used to create a cookie is _____.	I	CO2
2F-11	The <b>setcookie()</b> function must be called before any _____ is sent to the browser.	I	CO2
2F-12	The first parameter of the <b>setcookie()</b> function is the _____ of the cookie.	III	CO2
2F-13	To access a cookie value in PHP, we use the superglobal array _____.	V	CO2
2F-14	A cookie can be deleted by setting its expiration time to a value in the _____.	I	CO2
2F-15	The _____ attribute prevents client-side scripts from accessing the cookie.	I	CO2
<b>Match the following</b>			
2M-1	Match the following	I	CO2

	a) setcookie() (i) Access cookie values in PHP b) \$_COOKIE (ii) Used to create a cookie c) HttpOnly (iii) Ensures the cookie is transmitted only over HTTPS d) Secure (iv) Restricts cookie access to HTTP only (improves security)		
2M-2	Match the following a) session_start() (i) Ends the session and clears session data b) session_destroy() (ii) Begins a new session or resumes an existing one c) isset() (iii) Sets a cookie to expire in 1 hour d) time() + 3600 (iv) Checks if a variable or cookie is set	I	CO2
2M-3	Match the following a) var (i) Declares a variable with block scope b) let (ii) Declares a variable with function scope c) const (iii) Returns the data type of a variable d) typeof (iv) Declares a constant value	I	CO2
2M-4	Match the following a) isNaN() (i) Executes a function after a specified delay b) setTimeout() (ii) Checks if a value is <b>not a number</b> c) addEventListener() (iii) Converts JSON string to JavaScript object d) JSON.parse() (iv) Attaches an event handler to an element	V	CO2
2M-5	Match the following a) JavaScript (i) Server-side scripting language b) PHP (ii) Client-side scripting language c) Node.js (iii) Server-side framework by Microsoft d) <b>ASP.NET</b> (iv) Server-side environment for JavaScript	IV	CO2

**5 MARKS QUESTIONS**

1.	Explain about PHP variables?	VI	CO2
2.	Evaluate PHP operators and flow controlling.?	IV	CO2
3.	Explain about cookies and authentication.?	I	CO2
4.	What are the types of scripting languages and explain it.?	II	CO2

5.	Describe about Arithmetic operators and its operations.?	III	CO2
6.	Write PHP program to print whether current year is leap year or not.?	II	CO2
7.	Write PHP script to display Fibonacci of length	V	CO2
8.	Summarize in brief about arrays in PHP with suitable examples.?	I	CO2
9.	Differentiate between client side scripting and server side scripting.	II	CO2
10.	Write a PHP code to do string manipulations?.	I	CO2
11.	Write PHP script to display the Fibonacci series of length 10.?	V1	CO2
12.	Explain about types of scripting languages.?	V	CO2
13.	Write and explain PHP working principle?	III	CO2
14.	Analyze the File handling methods and explain with example.?	II	CO2
15.	Explain the cookies authentication with program.?	I	CO2

**Unit – III : DATABASE ESSENTIALS**

**Multiple Choice Questions**

3C-1	Which of the following is an example of a relational database?  A) MongoDB  B) Oracle  C) Redis  D) Neo4j	I	CO3
3C-2	Which language is used to query data from relational databases?  A) HTML  B) JavaScript  C) SQL  D) Python	III	CO3
3C-3	Which SQL command is used to create a new database?  A) MAKE DATABASE  B) NEW DATABASE  C) CREATE DATABASE  D) INIT DATABASE	II	CO3

3C-4	<p>What is the function of the PRIMARY KEY in a database table?</p> <p>A) Ensures data security  B) Uniquely identifies each record  C) Links tables together  D) Controls data redundancy</p>	I	CO3
3C-5	<p>Which command is used to remove all records from a table without deleting the table itself?</p> <p>A) DROP  B) DELETE  C) REMOVE  D) TRUNCATE</p>	IV	CO3
3C-6	<p>Which of the following is a NoSQL database?</p> <p>A) MySQL  B) PostgreSQL  C) MongoDB  D) SQLite</p>	I	CO3
3C-7	<p>Which SQL function is used to count the total number of rows in a table?</p> <p>A) SUM()  B) COUNT()  C) TOTAL()  D) NUMBER()</p>	I	CO3
3C-8	<p>Which of the following is an example of DDL (Data Definition Language)?</p> <p>A) INSERT  B) DELETE  C) UPDATE  D) CREATE</p>	I	CO3

3C-9	<p>What does the term 'Normalization' refer to in databases?</p> <p>A) Increasing redundancy</p> <p>B) Optimizing data storage by eliminating redundancy</p> <p>C) Encrypting sensitive data</p> <p>D) Creating database backups</p>	I	CO3
3C-10	<p>Which database type stores data in table format with rows and columns?</p> <p>A) Hierarchical Database</p> <p>B) Relational Database</p> <p>C) Object-Oriented Database</p> <p>D) Document Database</p>	I	CO3
3C-11	<p>What is the main purpose of an index in a database?</p> <p>A) To enforce data constraints</p> <p>B) To speed up query execution</p> <p>C) To store duplicate records</p> <p>D) To create relationships between tables</p>	III	CO3
3C-12	<p>Which of the following types of indexes allows for faster searching of text data?</p> <p>A) Clustered Index</p> <p>B) Full-Text Index</p> <p>C) Unique Index</p> <p>D) Composite Index</p>	III	CO3
3C-13	<p>Which SQL command is used to create an index?</p> <p>A) MAKE INDEX</p> <p>B) CREATE INDEX</p> <p>C) ADD INDEX</p> <p>D) BUILD INDEX</p>	III	CO3
3C-14	<p>Which function returns the maximum value in a column?</p> <p>A) MAX()</p> <p>B) HIGH()</p> <p>C) GREATEST()</p>	I	CO3

	D) MAXIMUM()		
3C-15	Which SQL function is used to round a numeric value to a specified number of decimal places?  A) ROUND()  B) TRUNC()  C) CEIL()  D) FLOOR()	V	CO3
<b>Fill in the blanks</b>			
3F-1	A _____ is a collection of related data organized in a way that allows efficient retrieval and management.	I	CO3
3F-2	The _____ model organizes data in a tree-like structure with parent-child relationships.	I	CO3
3F-3	In a relational database, a _____ uniquely identifies each record in a table.	II	CO3
3F-4	A _____ key is used to establish relationships between two tables.	I	CO3
3F-5	The process of organizing data to reduce redundancy is called _____.	V	CO3
3F-6	The SQL command used to retrieve data from a database is _____.	I	CO3
3F-7	The _____ clause is used to filter records based on a specified condition.	II	CO3
3F-8	To add new data to a table, the _____ command is used.	I	CO3
3F-9	The SQL command used to delete an entire table structure (including data) is _____.	I	CO3
3F-10	To count the number of rows in a table, the function _____ is used.	II	CO3
3F-11	The _____ function is used to find the highest value in a column.	I	CO3
3F-12	To connect to a MySQL database in PHP, the function _____ is commonly used for procedural programming.	I	CO3
3F-13	In PHP, the function _____ is used to execute an SQL query.	II	CO3
3F-14	To close a MySQL database connection in PHP, the function _____ is used.	IV	CO3
3F-15	To select a database after establishing a connection, the function _____ is used.	I	CO3
<b>Match the following</b>			

3M-1	Match the following a) Primary Key (i) Used to connect PHP to a MySQL database b) mysqli_connect() (ii) Ensures data uniqueness in a table c) COUNT() (iii) Establishes a link between two tables d) Foreign Key (iv) Returns the number of rows in a table	I	CO3
3M-2	Match the following a) mysqli_query() (i)Deletes a table structure and its data b) DROP TABLE (ii) Executes an SQL query in PHP c) WHERE Clause (iii) Rounds off decimal values to a specified precision d) ROUND() (iv) filters records based on a condition	I	CO3
3M-3	Match the following a) Relational Database (i) Uniquely identifies each record in a table b) Primary Key (ii) Organizes data in tables with rows and c) Foreign Key (iii) Reduces data redundancy and improves data integrity d) Normalization (iv) Establishes a relationship between two tables	I	CO3
3M-4	Match the following a) Data Redundancy (i) Structured Query Language used to manage databases b) SQL (ii) Duplication of data in multiple database locations c) ER Diagram (iii) Ensures database transactions are Atomic, Consistent, Isolated, and Durable d) ACID Properties (iv) Visual representation of database relationships	IV	CO3
3M-5	Match the following a) mysqli_connect() (i) Executes an SQL query in PHP b) mysqli_query() (ii) Establishes a connection to the MySQL server c) mysqli_fetch_assoc() (iii)Closes the MySQL database connection d) mysqli_close() (iv) Fetches a result row as an associative array	V	CO3
<b>5 MARKS QUESTIONS</b>			
1.	Write and explain database management ,atabase terms.?	III	CO3
2.	Describe mysql commands.?	II	CO3
3.	Explain about accessing MYSQL using PHP .?	IV	CO3
4.	Summarize Various Index in database?	I	CO3

5.	Describe detail about Data Types ?	II	CO3
6.	Write any 20 commands with its functions ?	I	CO3
7.	Describe detail about Data Types.in database?	II	CO3

8.	Describe views in DBMS?.	V	CO3
9.	Explain following Commands i. UPDATE — ii. DELETE — iii. INSERT INTO iv. CREATE DATABASE v. ALTER DATABASE vi. CREATE TABLE vii. ALTER TABLE ?	VI	CO3
10.	Explain Data Base Management ?	III	CO3
11.	Explain the following commands with examples.? A.SELECT B.SELECT COUNT C.SELECT DISTINCT	VI	CO3
12.	Describe mysql commands.?	I	CO3
13.	Describe function in databse?	II	CO3
14.	Analyze the Database Queries.?	II	CO3
15.	Explain the difference between a database and a database management system (DBMS).	II	CO3
<b>Unit – IV : NETWORKING ESSENTIALS</b>			
<b>Multiple Choice Questions</b>			
4C-1	What is a computer network? a) A device used to display information on a computer screen b) A collection of interconnected computers and devices that can communicate and share resources c) A type of software used to create documents and presentations d) The physical casing that protects a computer’s internal components	I	CO4
4C-2	2. What are nodes in a computer network? a) the computer that routes the data b) the computer that terminates the data c) the computer that originates the data d) all of the mentioned	I	CO4
4C-3	3.Which protocol ensures reliable delivery A. UDP B. IP C. TCP	IV	CO4

	D. NETBEUI		
4C-4	4.Which protocol deals with resolving domain names A. SMTP B. DNS C. SPX D. NETBIOS	IV	CO4
4C-5	5. Wireless Local Area Network is based on _____ standards of IEEE? A 802.10 B 802.11 C 802.12 D.802.13	II	CO4
4C-6	6. Which one of the following switches uses store and forward transmission? A. Circuit switching B. Packet switching C. Both a and b D.None of the above	IV	CO4
4C-7	7.What is the standard form of ICMP? A. Internet Common Message Protocol B.Internet Code Message Protocol C. Internet Control Message Protocol D.None of the above	I	CO4
4C-8	8.Ethernet frame consists of _____ A) MAC address B) IP address C) Default mask D) Network address	I	CO4
4C-9	9. Which of the deals with routing tables. A. Forwarding B. Routing C.Directing D.None of the above	V	CO4
4C-10	Which routing uses the Dijkstra algorithm to build routing table A. distance vector B. link state C.path vector D.none of the above	IV	CO4

4C-11	11. Which is a set of rules governing data communication between two devices A. Protocol B. Message C. Medium D. Sender	II	CO4
4C-12	12. Which of the following is not an application layer service? a) Network virtual terminal b) File transfer, access, and management c) Mail service d) Error control	II	CO4
4C-13	13. Which of the following is an example of Bluetooth? a) wide area network b) virtual private network c) local area network d) personal area network	I	CO4
4C-14	14. Which of the following devices forwards packets between networks by processing the routing information included in the packet? a) firewall b) bridge c) hub d) router	IV	CO4
4C-15	Which topology requires a multipoint connection? a) Ring b) Bus c) Star d) Mesh	II	CO4
	Fill in the blanks		
4F-1	1. _____ is a dedicated link between the sender and the receiver.	II	CO4
4F-2	2. All computers connected to the Internet and wanting to use it for sending/receiving data must follow a common set of rules for communication called _____.	IV	CO4
4F-3	3. The _____ topology has a central controller.	IV	CO4
4F-4	4. A MAC address consumes _____ bytes or _____ bits.	II	CO4
4F-5	5. The _____ is the protocol used to make hypertext document readable on the WWW.	II	CO4

4F-6	6.A _____ is a set of devices (nodes) connected by media links	IV	CO4
4F-7	7. The packet of information at the application layer is called _____	II	CO4
4F-8	8.Application layer offers _____ service.	I	CO4
4F-9	9.IP packet is called a _____.	I	CO4
4F-10	10.Wi-Fi requires a _____ to broadcast the signal wirelessly.	IV	CO4
4F-11	11.Ethernet is a _____ network connection that uses cables to connect devices.	IV	CO4
4F-12	12.A _____ is a basic networking device that broadcasts data to all connected devices.	V	CO4
4F-13	13.A _____ is used to monitor and control incoming and outgoing network traffic for security.	I	CO4
4F-14	14.The _____ layer in the TCP/IP model is responsible for routing and logical addressing.	IV	CO4
4F-15	15.The _____ protocol breaks data into packets at the Transport layer.	I	CO4
	Match the following		
3M-1	Match the following. 1. Hub            A.Datalink layer 2. Switch        B.Network layer 3. Router        C.Application layer 4. Gateway      D.Transport layer.	I	CO4
3M-2	1.IP Address    A. Connects multiple networks 2.Router        B. Identifies a device on a network 3.TCP/IP        C. Local area network 4.LAN            D. Network communication protocol	II	CO4
3M-3	1.WAN           A.Local Area Network 2.MAN           B.Wide Area Network 3.PAN            C.Metropolitan Area Network 4.LAN            D.Personal Area Network	IV	CO4

3M-4	<b>1.Application Layer</b> a..Provides end-to-end communication and error handling <b>2.Transport Layer</b> b. Supports network services and applications <b>3.Internet Layer</b> c. Responsible for the actual transmission of data over physical media <b>4.Link Layer</b> d. Responsible for routing data across networks and logical addressing	V	CO4
3M-5	<b>1.Ethernet</b> A.Wireless connectivity <b>2.Wi-Fi</b> B.Requires cables <b>3.Routing</b> C.Uses wireless access points <b>4.WLAN</b> D.Directs data packets between network	II	CO4
<b>5 MARKS QUESTIONS</b>			
1	Explain the Datalink, Physical and Networks Layers in OSI model	II	CO4
2	Describe the some advantages of Bus and Star Topology	I	CO4
3	Briefly discuss about the TCP/IP Protocol architecture	I	CO4
4	Describe the Importance of TCP / IP and compare with OSI	II	CO4
5	Describe the Basic communication model with an example	III	CO4
6	Draw the IPv4 header format and explain it in detail.	I	CO4
7	Summarize the different types of transmission medium used in network	I	CO4
8	Describe the WIFI network services.	IV	CO4
9	What are routers? Explain in detail?	IV	CO4
10	State the difference between WLAN and WAN?	II	CO4
11	Explain packet switching in detail.	I	CO4

12	Explain in detail about Wireless LAN protocols	I	CO4
13	Describe the various network topologies in details.	III	CO4
14	Write the differences between packet switching and circuit switching	III	CO4
15	Discuss about the Firewall and modem	III	CO4
<b>Unit – V : APPLICATION ESSENTIALS</b>			
<b>Multiple Choice Questions</b>			
5C-1	1. Which of the following is an example of a simple interactive application? A. Calculator app B. Static web page C. Printed book D. Pdf document	IV	CO5
5C-2	2. Which of the following is a database management system (DBMS)? A. MS Excel B. MS Word C. MySQL D. Adobe Photoshop	I	CO5
5C-3	3. Which of the following is used to uniquely identify each record in a table?  A. Foreign Key B. Column C. Primary Key D. Index	IV	CO5
5C-4	4. Which of the following is not a component of multimedia? A. Text B. Graphics C. Compiler D. Video	II	CO5
5C-5	5. Which application is commonly used for multimedia presentations? A. Microsoft Word B. Microsoft PowerPoint C. Excel D. Notepad		CO5

5C-6	6. Which of the following is a widely used multimedia file format? A. .exe B. .txt C. .mp4 D. .docx	IV	CO5
5C-7	7. What is the primary function of a Personal Information System (PIS)? A. Manage financial data B. Handle inventory details C. Store and manage individual personal data D. Process sales reports	V	CO5
5C-8	8. What type of data is considered <i>sensitive personal information</i> in a PIS? A. Email address B. Age C. Health records D. Job title	II	CO5
5C-9	9. What does the acronym PIS stand for in IT and management systems? A. Private Internet Software B. Personal Identification System C. Personal Information System D. Public Information Storage	IV	CO5
5C-10	10. What is the main goal of an Information Retrieval System? A. Store multimedia content B. Retrieve relevant documents based on user queries C. Process spreadsheets D. Translate languages	II	CO5
5C-11	11. In IRS, a user's input is known as a: A. File B. Query C. Record D. Dataset	II	CO5
5C-12	12. What is the main purpose of a social networking site? A. Edit documents B. Perform calculations C. Connect and communicate with people D. Design web pages	IV	CO5
5C-13	13. What is a "hashtag" used for in social media? A. Logging out of apps	III	CO5

	B. Searching and categorizing content C. Sending private messages D. Blocking users		
5C-14	14. Which of the following technologies is a key component of the Internet of Things (IoT)? A. Data encryption B. Virtual reality C. Sensor and connectivity technologies D. Blockchain	II	CO5
5C-15	15. Which of the following is the first phase of the system development life cycle (SDLC)? A. Design B. Implementation C. Planning and Analysis D. Maintenance	IV	CO5
<b>Fill in the blanks</b>			
5F-1	1. In a relational database, data is stored in the form of _____.	IV	CO5
5F-2	2. _____ keyword is used to modify existing records	II	CO5
5F-3	3. The software used to manage and interact with a database is called a _____.	III	CO5
5F-4	4. The full form of GIF is _____.	IV	CO5
5F-5	5. Multimedia applications are commonly used in _____	I	CO5
5F-6	6. _____ technology is often used to secure access to a PIS.	I	CO5
5F-7	7. The process of converting a document into a searchable format is called _____	III	CO5
5F-8	8. _____ is a professional social networking site used for job searching and business networking.	IV	CO5
5F-9	9. WhatsApp is a messaging app owned by _____.	V	CO5

5F-10	10.Snapchat is known for its disappearing _____ messages.	I	CO5
5F-11	11._____ refers to high-speed wireless communication technology that is expected to revolutionize mobile networks and connectivity.	II	CO5
5F-12	12.A _____ is a model of working remotely, where employees perform their tasks from home or other locations outside the office.	IV	CO5
5F-13	13.In the _____ model, development progresses through a series of iterations revisiting and refining earlier phases.	III	CO5
5F-14	14._____ is the process of evaluating a system in terms of performance, security, and usability after it is installed.	II	CO5
5F-15	15._____ diagrams are used in system analysis to show how data flow through the system.	IV	CO5
<b>Match the following</b>			
5M-1	Match the following 1.Codec                      A.Captures live video 2. Webcam                    B. Compresses and decompresses files 3.Adobe Photoshop        C. Image editing software 4.MP3                            D. Animation software	I	CO5
5M-2	1. Personal Information System      A.Department that primarily uses PIS 2. Human Resources (HR)            B.System to manage and store personal data 3.Biometric Login                        C.Ensures records are correct and up-to-date 4. Data Accuracy                         D. identity using fingerprint or face	III	CO5
5M-3	1. Facebook            A.Social network for sharing photos and stories 2. Instagram            B.One of the first global social networking platforms 3.Twitter                C.Social platform known for short viral videos 4.TikTok                 D.Platform popular for real-time text-based updates	II	CO5
5M-4	1. Artificial Intelligence      A.A system that records transactions across multiple computers 2. Cybersecurity                B.Network of physical devices connected via the internet 3. Blockchain                    C.Machines performing tasks that require human intelligence 4. Internet of Things (IoT)    D.Security measures for protecting digital data and networks	III	CO5
5M-5	1.System Analysis      A.Process of ensuring a system performs well after deployment 2. System Design        B.Phase where the system is installed and made operational 3. Implementation        C.Identifies the current system problems and defines user needs 4. Maintenance            D.Process of converting requirements into system specifications	II	CO5
<b>5 MARKS QUESTIONS</b>			

1	Explain the steps for creating simple interactive applications	II	CO5
2	2.What is multimedia?Explain the components and applications of multimedia?	II	CO5
3	Explain the following in database applications. a. Primary key b. Private key c. Foreign key d. Composite key	IV	CO5
4	What is information system? Explain the steps involved in design and development of IS?	II	CO5
5	5. Explain how a Personal Information System is used in Human Resource Management.	IV	CO5
6	6.Describe the role of multimedia in education and training?	II	CO5
7	7.Explain the types of social networking applications.	II	CO5
8	8.Discuss the issues of social networking applications.	IV	CO5
9	9.Draw the ER diagram for the relationship of teacher and course.	VI	CO5
10	10.Explain the characteristics of Information retrieval systems.	II	CO5
11	<b>11.</b> Explain the different phases of the System Development Life Cycle (SDLC).	II	CO5
12	12.Explain the difference between a DBMS and an RDBMS.	II	CO5
13	13.List and explain different types of database relationships?	IV	CO5
14	14.What is an Information Retrieval System? Explain its purpose with advantages and disadvantages	II	CO5
15	<b>15.</b> Explain the role of event handling in interactive application?	IV	CO5

# **MODEL QUESTION PAPER**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

**III B.Tech-II Semester–End Examinations (Model paper)**

**Information Technology Essentials(R22INF3235)**

**Duration: 3 Hrs**

**Max Marks: 60 M**

**Section – A**

<b>Answer <u>All</u> of the following questions</b>		<b>Marks: 10Qx1M = 10M</b>		
		<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
1	Describe about the functions defined by Web Browser?	1	CO1	I
2	Explain about HTML tags with an example.?	1	CO1	IV
3	What are the types of scripting languages ?	1	CO2	I
4	Write PHP program to print whether current year is leap year or not.?	1	CO2	IV
5	Explain Data Base Management ?	1	CO3	II
6	Explain the following commands with examples.? A. SELECT B.SELECT COUNT C.SELECT DISTINCT	1	CO3	VI
7	Briefly discuss about the TCP/IP Protocol architecture?	1	CO4	I
8	What are routers?	1	CO4	V
9	What is information system?	1	CO5	II
10	Explain the following in database applications. a. Primary key b. Private key	1	CO5	II

**Section – B**

<b>Answer any <u>FIVE</u> questions choosing at least one from each Unit</b>		<b>Marks: 5Qx10M = 50M</b>		
		<b>Marks</b>	<b>Course Outcome</b>	<b>BT Level</b>
<b>UNIT-I</b>				
11.	Describe the procedure to create a website.? <b>(OR)</b>	10	CO1	V,II
12.	Evaluate HTTP request and HTTP response.?			

<b>UNIT-II</b>			
13. Write a PHP code to do string manipulations? (OR) 14. Analyze the File handling methods and explain with example.?	10	CO2	I,II
<b>UNIT-III</b>			
15.Explain about accessing MYSQL using PHP .? (OR) 16. Describe detail about Data Types.in database?	10	CO3 CO3	IV,II
<b>UNIT – IV</b>			
17. Briefly discuss about the TCP/IP Protocol architecture (OR) 18 State the difference between WLAN and WAN?	10	CO5	II,I
<b>UNIT – V</b>			
19. What is multimedia? Explain the components and applications of multimedia? (OR) 20. Discuss the issues of social networking applications.	10	CO5	II,IV

S.NO	Bloom Taxonomy Level	No. Of. Questions	%	Name & Signature of Paper Setter
1	Fundamental Knowledge from level I & II	6	60	
2	Knowledge on application & Analysis from level III & IV	2	20	
3	Critical thinking and ability to design from level V & VI	2	20	

**MID  
QUESTION PAPERS**

Duration: 2 Hrs

Dt: 26-03-2025, Day-3 (FN)

Max Marks: 30M

**Part - A (10 Marks)**

Bloom's Taxonomy Levels : I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating, and VI-Creating.  
 Course Outcomes: CO

**SECTION A1: Answer All multiple choice questions.**

Marks: 10Qx1/2M = 5M

- |   |     |     |
|---|-----|-----|
| 1. Which of the following is a key component of a website's front-end?<br>A) PHP B) Python C) HTML D) MySQL   | I   | CO1 |
| 2. What is the primary function of JavaScript on a website?<br>A) To style content B) To structure content<br>C) To add interactivity D) To manage databases  | I   | CO1 |
| 3. Which tag is used for adding metadata in an HTML document?<br>A) <meta> B) <head> C) <link> D) <body>  | I   | CO1 |
| 4. Which programming language is commonly used with Apache Tomcat?<br>A) Python B) Java C) PHP D) Ruby  | II  | CO1 |
| 5. Which of the following is NOT a scripting language?<br>A) Python B) JavaScript C) C++ D) Bash  | II  | CO2 |
| 6. What is the output of the following Python code?<br>x = Sprint(x == 5) print(x == 5)<br>A) True followed by True B) True followed by False<br>C) True followed by an error D) False followed by True | II  | CO2 |
| 7. Which file extension is commonly used for Python scripts?<br>A) .bash B) .py C) .sh D) .js   | IV  | CO2 |
| 8. Which of the following is a valid way to declare a variable in PHP?<br>A) int x = 5; B) var x = 5; C) \$x = 5; D) x := 5;  | VI  | CO2 |
| 9. Which language is used to query data from relational databases?<br>A) HTML B) JavaScript C) SQL D) Python  | III | CO3 |
| 10. Which SQL function is used to count the total number of rows in a table?<br>A) SUM() B) COUNT() C) TOTAL() D) NUMBER()  | I   | CO3 |

**SECTION A2: Answer All fill in the blank questions.**

Marks: 6Qx1/2M = 3M

- |  |    |     |
|--|----|-----|
| 11. To define a clickable button in HTML, you use the <_____> tag.                         | II | CO1 |
| 12. The _____ server translates domain names into IP addresses for locating web resources. | II | CO1 |
| 13. Variables in PHP are declared using the _____ symbol.                                  | II | CO2 |
| 14. PHP files are saved with the extension _____.  | II | CO2 |
| 15. A _____ key is used to establish relationships between two tables.                     | I  | CO2 |
| 16. The process of organizing data to reduce redundancy is called _____.                   | V  | CO3 |

P.T.O

**SECTION A3: Answer All Match the following questions**

**Marks: 2Qx15**

17.	1. HTML	A. Serves web content like HTML, CSS, and images	I
	2. Web server	B. Defines the structure of web content	
	3. DNS server	C. Provides dynamic content handling	
	4. Application server	D. Translates domain names to IP addresses	

18.	1. var	A. Declares a variable with block scope	I
	2. let	B. Declares a variable with function scope	
	3. const	C. Returns the data type of a variable	
	4. typeof	D. Declares a constant value	

**Part - B (20 Marks)**

**Answer any FOUR questions.**

**Marks: 4Qx5**

- 19. Discuss about types of servers. II
- 20. Evaluate HTTP request and HTTP response. V
- 21. Explain about cookies and authentication. I
- 22. Summarize in brief about arrays in PHP with suitable examples. I
- 23. Write a PHP code to do string manipulations. I
- 24. Describe mysql commands. II

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