



Estd. 2001

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

II Year I 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

HANDOUT- INDEX

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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

IM₁ Provide high quality academic programs, training activities and research facilities.

IM₂ Promote Continuous Industry-Institute Interaction for Employability, Entrepreneurship, Leadership and Research aptitude among stakeholders.

IM₃ 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:

DM₁ To offer high quality student centric education in Information Technology.

DM₂ To provide a conducive environment towards innovation and skills.

DM₃ To involve in activities that provide social and professional solutions.

DM₄ 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	Engineering Knowledge: 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	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO 3	Design/Development of Solutions: 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	Conduct Investigations of Complex Problems: 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	Engineering Tool Usage: 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	The Engineer and The World: 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	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO 8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO 9	Communication: 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	Project Management and Finance: 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	Life-Long Learning: 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	Software Development: To apply the knowledge of Software Engineering, Data Communication, Web Technology and Operating Systems for building IOT and Cloud Computing applications.
PSO 2	Industrial Skills Ability: Design, develop and test software systems for world-wide network of computers to provide solutions to real world problems.
PSO 3	Project implementation: Analyze and recommend the appropriate IT Infrastructure required for the implementation of a project.



Lr.No.SICET/AUTO/DAE/II B.Tech (BR-22) Academic Calendar/182/2023

Dt: 01.09.2023

Dr. G. SURESH,
Principal,

To,
All the HODs.

B.TECH II-YEAR (I-SEM & II-SEM) ACADEMIC CALENDAR
ACADEMIC YEAR : 2023-24

Sir,

Sub: SICET (Autonomous) - Academic & Evaluation - Academic Calendar for **B.Tech – II Year** for the academic year **2023-24** – Reg.

The approved Academic Calendar for **B.Tech – II Year (I & II Sem)** for the academic year **2023-24** is given below:

Academic Calendar for B.Tech – II Year Students (2022 - 23 Batch), BR-22 Regulation.

I – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work	13.09.2023 (Wednesday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	13.09.2023 – 21.10.2023	5 Weeks 4 Days
3.	Dasara Vacation.	23.10.2023 – 28.10.2023	1 Week
4.	Continuation of 1 st Spell of Instructions for covering First Two and a half Units.	30.10.2023 – 14.11.2023	2 Weeks 2 Days
5.	I Mid Term Examinations.	15.11.2023 – 18.11.2023	4 Days
6.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before.	23.11.2023	
7.	2 nd Spell of Instructions for covering Remaining Two and a half Units.	20.11.2023 – 12.01.2024	8 Weeks
8.	Sankranti Holidays.	13.01.2024 – 16.01.2024	4 Days
9.	II Mid Term Examinations.	17.01.2024 – 19.01.2024	3 Days
10.	Preparation Holidays & Practical Examination.	20.01.2024 – 27.01.2024	1 Week
11.	Submission of II Mid Term Examination Marks to the Autonomous Section on or before.	25.01.2024	
12.	I Semester End Examinations	29.01.2024 – 10.02.2024	2 Weeks
Commencement of Class-Work for II B.Tech - II Semester 12.02.2024 (Monday)			

II – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work	12.02.2024 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	12.02.2024 – 06.04.2024	8 Weeks
3.	I Mid Term Examinations.	08.04.2024 – 13.04.2024	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before.	18.04.2024	
5.	2 nd Spell of Instructions for covering Remaining Two and a half Units.	15.04.2024 – 11.05.2024	4 Weeks
6.	Summer Vacation.	13.05.2024 – 25.05.2024	2 Weeks
7.	Continuation of 2 nd Spell of Instructions for covering Remaining Two and a half Units.	27.05.2024 – 22.06.2024	4 Weeks
8.	II Mid Term Examinations.	24.06.2024 – 26.06.2024	3 Days
9.	Preparation Holidays & Practical Examination.	27.06.2024 – 06.07.2024	1 Week 3 Days
10.	Submission of II Mid Term Examination Marks to the Autonomous Section on or before.	02.07.2024	
11.	II Semester End Examinations	08.07.2024 – 20.07.2024	2 Weeks
Commencement of Class-Work for III B.Tech - I Semester 22.07.2024 (Monday)			

ACE

CE

DIRECTOR

PRINCIPAL

Copy to DAE & Copy to all the Heads of the Depts.

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

SRIINDUCOLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech –II Year– I Semester

L T P C
3 0 0 3

(R22ECE2113) DIGITAL LOGIC DESIGN

Objectives:

- To understand common forms of number representation in logic circuits.
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.
- To understand the Realization of Logic Gates Using Diodes & Transistors.

UNIT-I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT –II

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method

Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT-III

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

UNIT-IV

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters.

UNIT-V

Finite state machine: capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of incompletely specified machines, Merger graphs.

Asynchronous design-modes of operation, Hazards, synthesis of SIC fundamental mode circuits, synthesis of burst mode circuits. Introduction to ASM Charts

Course Outcomes:

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

Course	Course outcomes
C213 [1]	Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems. (K5-Evaluating)
C213 [2]	Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.(K4-Analyse)
C213 [3]	Design and analyse sequential circuits for various cyclic functions.(K4-Analyse)
C213 [4]	Characterize logic families and analyze them for the purpose of AC and DC parameters.(K5-Evaluating)

Course Articulation Matrix:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO7	PO 8	PO 9	PO1 0	PO 11	PO 12	PSO1	PSO 2	PSO 3
C213.1	2	2	1	2	2	-	-	-	-	-	-	2	3	-	2
C213.2	2	2	3	2	2	-	1	-	1	-	-	-	3	3	-
C213.3	3	2	3	1	2	1	-	-	-	-	-	1	2	-	-
C213.4	2	2	3	2	2	-	-	-	-	-	-	1	2	-	2
C213.5	2	-	3	-	2	-	-	-	-	-	-	1	1	-	1
C213.6	1	-	3	2	3	-	-	-	-	-	-	1	2	2	1
C213	2	2	2.6	1.8	2.1	1	1	-	1	-	-	1.2	2	2.5	1.5



SRI INDU COLLEGE OF ENGG & TECH
LESSON PLAN
 (Regulation: R22)
 Department of Information
 Technology

R22

Sub. Code & Title	R22ECE2113 DIGITAL LOGIC DESIGN		
Academic Year: 2024-2025	Year/Sem./Section	II/I/A	
Faculty Name & Designation	Mr A. VENU Asso Professor/CSIT		

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
UNIT – I									
I	Number Systems And Boolean algebra					17			
1.1	Introduction	T1	1	1	Black board	01		CO-1	
1.2	Number Systems	T1	1	9	Blackboard	01		CO-1	
1.3	Complements of Numbers	T1	9	12	Blackboard	01		CO-1	
1.4	Codes- Weighted	T1	15	20	Blackboard	01		CO-1	
1.5	Non-weighted codes and its Properties	T1	25	28	Blackboard	01		CO-1	
1.6	Parity check code	T1	51	52	Blackboard	01		CO-1	
1.7	Hamming code	T1	52	54	Blackboard	01		CO-1	
1.8	Boolean algebra: Introduction	T1	88	88	Blackboard	01		CO-1	
1.9	Basic Theorems and Properties	T1	89	90	Blackboard	01		CO-1	
1.10	Switching Functions- Canonical and Standard Form	T1	95	99	Black board	01		CO-1	
1.11	Algebraic Simplification	T1	101	103	Black board	01		CO-1	
1.12	Digital Logic Gates	T1	104	107	Black board	01		CO-1	
1.13	EX-OR gates	T1	108	110	Black board	01		CO-1	
1.14	Universal Gates	T1	112	113	Black board	01		CO-1	
1.15	Multilevel NAND/NOR realizations	T1	114	115	Black board	01		CO-1	
1.16	Problems	T1	131	133	Black board	01		CO-1	
1.17	Problems	T1	135	137	Black board	01		CO-1	
	Review	Signature of the HOD/Coordinator							

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
UNIT – II								
II	Minimization of Boolean functions And Realization of Logic Gates Using Diodes & Transistors					15		
2.1	Introduction	T1	151	152	Black board	01		CO-2
2.2	Karnaugh Map Method - Up to five Variables	T1	153	160	Black board	01		CO-2
2.3	Don't Care Map Entries	T1	170	178	Black board	01		CO-2
2.4	Tabular Method	T1	184	192	Black board	01		CO-2
2.5	Realization of Logic Gates Using Diodes & Transistors: Introduction	R1	42	43	Black board	01		CO-2
2.6	AND, OR and NOT Gates using Diodes and Transistors	R1	44	47	Black board	01		CO-2
2.7	DCTL, RTL	R1	50	52	Black board	01		CO-2
2.8	DTL, TTL	R1	53	56	Black board	01		CO-2
2.10	CML and CMOS Logic Families and its Comparison	R1	60	63	Black board	01		CO-2
2.11	standard TTL NAND Gate-Analysis & characteristics	R1	64	66	Black board	01		CO-2
2.12	TTL open collector O/Ps	R1	68	69	Black board	01		CO-2
2.13	Tristate TTL	R1	75	76	Black board	01		CO-2
2.14	MOS & CMOS open drain and tri-state outputs	R1	81	84	Black board	01		CO-2
2.15	IC interfacing- TTL driving CMOS & CMOS driving TTL.	R1	85	87	Black board	01		CO-2
	Review	Signature of the HOD/Coordinator						

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
UNIT – III								
III	Combinational Logic Circuits And Sequential Circuits Fundamentals					17		
3.1	Introduction	T1	211	212	Black board	01		CO-3
3.2	Adders, Subtractors	T1	213	215	Black board	01		CO-3
3.3	Comparators,	T1	216	218	Black board	01		CO-3
3.4	Multiplexers, Demultiplexers	T1	270	276	Black board	01		CO-3
3.5	Encoders, Decoders	T1	280	284	Black board	01		CO-3
3.6	Code converters	T1	294	304	Black board	01		CO-3
3.7	Hazards and Hazard Free Relations	T1	312	316	Black board	01		CO-3
3.8	Sequential Circuits Fundamentals: Introduction	T1	401	402	Black board	01		CO-3
3.9	Basic Architectural Distinctions between Combinational and Sequential circuits	T1	404	406	Black board	01		CO-3
3.11	SR Latch, Flip Flops	T1	408	410	Black board	01		CO-3
3.12	SR, JK Flip Flops	T1	411	412	Black board	01		CO-3

3.13	JK Master Slave Flip Flops	T1	414	415	Black board	01		CO-3	
3.14	D and T Type Flip Flops	T1	417	418	Black board	01		CO-3	
3.15	Excitation Table of all Flip Flops	T1	425	427	Black board	01		CO-3	
3.16	Timing and Triggering Consideration	T1	429	430	Black board	01		CO-3	
3.17	Conversion from one type of Flip-Flop to another	T1	432	435	Black board	01		CO-3	
	Review	Signature of the HOD/Coordinator							

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
UNIT – IV									
IV	Registers and Counters					13			
4.1	Introduction	T1	450	451	Black board	01		CO-3	
4.2	Shift Registers – Left, Right	T1	452	456	Black board	01		CO-3	
4.3	Bidirectional Shift Registers	T1	457	459	Black board	01		CO-3	
4.4	Applications of Shift Registers	T1	460	461	Black board	01		CO-3	
4.5	Design and Operation of Ring and Twisted Ring Counter	T1	470	472	Black board	01		CO-3	
4.6	Operation of Asynchronous and Synchronous Counters	T1	473	476	Black board	01		CO-3	
4.7	Sequential Machines: Introduction	T1	510	511	Black board	01		CO-3	
4.8	Finite State Machines	T1	512	514	Black board	01		CO-3	
4.9	Synthesis of Synchronous Sequential Circuits	T1	515	517	Black board	01		CO-3	
4.10	Serial Binary Adder	T1	518	519	Black board	01		CO-3	
4.11	Sequence Detector	T1	520	521	Black board	01		CO-3	
4.12	Parity-bit Generator	T1	524	526	Black board	01		CO-3	
4.13	Synchronous Modulo N –Counters	T1	527	529	Black board	01		CO-3	
	Review	Signature of the HOD/Coordinator							

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
UNIT – V								
V	Finite state machine					11		
5.1	Introduction	T1	620	621	Black board	01		CO-4
5.2	capabilities and limitations	T1	623	625	Black board	01		CO-4
5.3	Mealy and Moore models	T1	627	629	Black board	01		CO-4
5.4	State equivalence and machine minimization	T1	630	632	Black board	01		CO-4
5.5	simplification of incompletely specified machines	T1	633	635	Black board	01		CO-4
5.6	Merger graphs	T1	641	642	Black board	01		CO-4

5.7	Asynchronous design-modes of operation	T1	644	646	Black board	01		CO-4	
5.8	Hazards, synthesis of SIC fundamental mode circuits	T1	648	650	Black board	01		CO-4	
5.9	synthesis of burst mode circuits	T1	660	661	Black board	01		CO-4	
5.11	Introduction to ASM Charts	T1	664	667	Black board	01		CO-4	
	Review	Signature of the HOD/Coordinator							

LIST OF TEXT BOOKS AND REFERENCES

TEXTBOOKS:

1. Zvi Kohavi & Niraj K. Jha, - Switching and Finite Automata Theory, 3rd Ed., Cambridge, 2010.
2. R. P. Jain - Modern Digital Electronics, 3rd Edition, 2007- Tata McGraw-Hill

REFERENCE BOOKS:

1. Morris Mano, Fredriac J. Hill, Gerald R. Peterson - Introduction to Switching Theory and Logic Design –3rd Ed., John Wiley & Sons Inc.
2. Charles H. Roth - Fundamentals of Logic Design, 5th ED., Cengage Learning, 2004.

ASSIGNMENT

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1	Convert following hexadecimal number to decimal (F28) ₁₆ b) (BC2) ₁₆	CO1	T1		
2	Convert following decimal to hexadecimal a) (1259) ₁₀ b) (5678) ₁₀	CO1	T1		
3	Convert (3576) ₈ to hexadecimal	CO1	T1		
4	Convert (11001011.01110) ₂ into decimal.	CO1	T1		
5	Using 2's complements method perform a) (57) ₁₀ -(28) ₁₀ b) (432) ₁₀ -(579) ₁₀	CO1	T1		
6	What is Karnaugh map? 4-variable k-map?	CO2	T1		
7	Draw the Boolean expression for K-map f(A,B,C) = $\sum(0,2,5)$?	CO2	T1		
8	Simplify F(A,B,C,D) = $\sum m(4,5,6,7,12,13,14)$ using K-map	CO2	T1		
9	Simplify F(A,B,C,D) = $\sum \pi(0,1,3,6,8,9,10,12,13,15)$ using K-map	CO2	R1		
10	Explain about the 5-variable k-map?	CO2	R1		
11	Design 32×1 Multiplexer using 8×1 Multiplexers and 2to4 decoder.	CO3	T1		
12	Build the full adder using two half adders and logic gates with truth table?	CO3	T1		
13	What is multiplexer? Design 8to1 mux using two 4to1 mux?	CO3	T1		
14	What is comparator? Design & implement a 2-bit comparator using logic gates?	CO3	T1		
15	Define combinational circuit?	CO3	T1		
16	Explain the types of registers.	CO3	T1		
14	Explain the operation of 4-bit shift right register .	CO3	T1		
18	Explain the operation of 4-bit shift left register.	CO3	T1		
19	Explain the operation of 4-bit bi-directional shift register.	CO3	T1		
20	Explain the operation of ring counter	CO3	T1		
21	Write the difference between Mealy and Moore type machines.	CO4	T1		
22	Draw the circuit for the Moore machine.	CO4	T1		
23	Explain the chart methods of minimal convertible.	CO4	T1		
24	What are the limitations and capabilities of an FSM.	CO4	T1		
25	Draw and explain the interaction between control logic and data path	CO4	T1		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

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

Unit-I				
MULTIPLE CHOICE QUESTIONS			BT Level	Course Outcome
1	According to boolean law: $A+1=?$ a) 1 b) A c) 0 d) A'	2	CO-1	
2	$A(A+B)=?$ a) AB b) 1 c) $(A+B)$ d) A	2	CO-1	
3	DeMorgan's theorem states that _____ a) $(AB)' = A' + B'$ b) $(A+B)' = A' * B'$ c) $A' + B' = A' B'$ d) $(AB)' = A' + B'$	2	CO-1	
4	Complement of the expression $A' B + CD'$ is _____ a) $(A' + B)(C' + D)$ b) $(A+B')(C'+D)$ c) $(A' + B)(C' + D)$ d) $(A+B')(C+D')$	1	CO-1	
5	Simplify $Y = AB' + (A' + B)C$. a) $AB' + C$ b) $AB + AC$ c) $A' B + AC'$ d) $AB + A$	2	CO-1	
6	The octal number (651.124) ₈ is equivalent to _____ a) $(1A9.2A)_{16}$ b) $(1B0.10)_{16}$ c) $(1A8.A3)_{16}$ d) $(1B0.B0)_{16}$	1	CO-1	
7	What is the addition of the binary numbers 11011011010 and 010100101? a) 0111001000 b) 1100110110 c) 1110111111 d) 10011010011	1	CO-1	
8	Perform binary subtraction: $101111 - 010101 = ?$ a) 100100 b) 010101 c) 011010 d) 011001	1	CO-1	
9	$100101 \times 0110 = ?$ a) 1011001111 b) 0100110011 c) 1011111110 d) 0110100101	1	CO-1	
10	The logical sum of two or more logical product terms is called _____ a) SOP b) POS c) OR operation d) NAND operation	1	CO-1	
11	In boolean algebra, the OR operation is performed by which properties? a) Associative properties b) Commutative properties c) Distributive properties d) All of the Mentioned	1	CO-1	
12	Code is a symbolic representation of _____ a) Discrete information b) Continuous information b) Decimal information into binary d) Binary information into decimal	2	CO-1	
13	Carry out BCD subtraction for $(68) - (61)$ using 10's complement method. a) 00000111b) 01110000c) 100000111d) 011111000	2	CO-1	
14	The expression for Absorption law is given by a) $A + AB = Ab$ b) $A + AB = Bc$ c) $AB + AA' = Ad$ d) $A + B = B + A$	1	CO-1	
15	The expression for Absorption law is given by _____ a) $A + AB = A$ b) $A + AB = B$ c) $AB + AA' = A$ d) $A + B = B + A$	2	CO-1	
FILL IN THE BLANKS				
1	The expression $Y = AB + BC + AC$ shows the _____ operation	1	CO-1	
2	2's complement of 11001011 is _____	1	CO-1	
3	1's complement of 1011101 is _____	2	CO-1	
4	On subtracting $(01010)_2$ from $(11110)_2$ using 1's complement _____	1	CO-1	
5	On addition of 28 and 18 using 2's complement _____	1	CO-1	

6	All input of NOR as low produces result as _____	2	CO-1
7	Octal to binary conversion: (24) ₈ = _____	2	CO-1
8	Convert the binary number (01011.1011) ₂ into decimal.	1	CO-1
9	What is the addition of the binary numbers 11011011010 and 010100101?	2	CO-1
10	Perform binary subtraction: 101111 – 010101 = _____	2	CO-1
11	1's complement of 1011101 is _____	1	CO-1
12	2's complement of 11001011 is _____	2	CO-1
13	The decimal number 10 is represented in its BCD form as _____	2	CO-1
14	Binary coded decimal is a combination of _____	2	CO-1
15	According to boolean law: $A + 1 =$ _____	1	CO-1
MATCH THE FOLLOWING			
1	MatchTheFollowingQuestions A) $ABC+ABC+AB'C$ 1. $A'+BC$ B) $A'BC'+ABC+BC$ 2. $A(B+C)$ C) $A'BC+AB'C+ABC'+ABC$ 3. BC' D) $A'B'+A'B+ABC$ 4. $AB+BC+AC$	2	CO-1
2	MatchTheFollowing Questions A)05 1.1000 B)08 2.1111 C)15 3.0101 D) 11 4.1011	1	CO-1
3	MatchTheFollowing Questions A) OR gate 1.A.B B) AND gate2.(A.B)' C)NOT gate 3.A+B D) NAND gate 4.A'	2	CO-1
4	MatchTheFollowing Questions A) A.0 1.A B)A.A2.0 C)A+1 3.(A+B)(A+C) D) A+BC 4.1	2	CO-1
5	MatchTheFollowing Questions A) Binary number1.0 to 15 B) Decimal number2.0 and 1 C)Octal number 3. 0 to 9 D) Hexadecimal number 4.0 to 7	1	CO-1
5 MARKS QUESTIONS			
		BT Level	Course Outcome
1.	Convert following hexadecimal number to decimal (F28) ₁₆ b) (BC2) ₁₆	3	CO-1
2.	Convert following decimal to hexadecimal b) (1259) ₁₀ b) (5678) ₁₀	2	CO-1
3.	Convert (3576) ₈ to hexadecimal	3	CO-1
4.	Convert (11001011.01110) ₂ into decimal.	2	CO-1
5.	Using 2's complements method perform b) (57) ₁₀ -(28) ₁₀ b) (432) ₁₀ -(579) ₁₀	1	CO-1
6.	Perform each of the following decimal additions in 8-4-2-1 BCD	5	CO-1

	a) 98,02 b)186, 237 c) 11, 29		
7.	Following decimal subtraction in 8-4-2-1 BCD using 9's complement method a)78,15 b)64,81 c)54,28	3	CO-1
8	Perform each of the following decimal additions in excess-3 code a)9,2 b)17,31 c)205,569	5	CO-1
9	Convert $(101011)_2$ to gray code	3	CO-1
10	List the binary, octal and hexadecimal numbers for decimal 0 to 15.	5	CO-1
11	A receiver with even parity hamming code is received the data as 1110110, determine the error code.	5	CO-1
12	Convert the given expression in standard POS form $F(A,B,C)=(A+B)(B+c)$ $F(A,B,C)=(A+B')(A+C)$	3	CO-1
13	Give the Boolean expressions used for following gates a) AND b)NOR c) Ex-OR d) OR c) NOT	3	CO-1
14	Realize EX-OR gate using NAND gate	4	CO-1
15	State and prove the following Boolean laws i)Commutative ii) Associative iii) Distributive	5	CO-1

Unit-II

MULTIPLE CHOICE QUESTIONS		BT Level	Course Outcome
1.	In DTL logic gating function is performed by _____ a) Diode b) Transistorc) Inductord) Capacitor	1	CO-2
2.	In DTL amplifying function is performed by _____ a) Diode b) Transistorc) Inductor d) Capacitor	1	CO-2
3.	How many stages a DTL consist of? a) 2b) 3c) 4d) 5	1	CO-2
4.	A major advantage of DTL over the earlier resistor–transistor logic is the _____ a) Increased fan outb) Increased fan in c) Decreased fan outd) Decreased fan in	1	CO-2
5.	All input of NOR as low produces result as _____ a) Lowb) Midc) Highd) Floating	1	CO-2
6.	In RTL NOR gate, the output is at logic 1 only when all the inputs are at _____ a) logic 0b) logic 1 c)+10V d) Floating	1	CO-2
8	The minimum number of transistors can be used by 2 input AND gate is _____ a) 2b) 3 c) 4 d) 5	1	CO-2
9	Transistor–transistor logic (TTL) is a class of digital circuits built from _____ a) JFET onlyb) Bipolar junction transistors (BJT) c) Resistorsd) Bipolar junction transistors (BJT) and resistors	1	CO-2
10	The full form of MOS is _____ a) Metal oxide semiconductorb) Metal oxygen semiconductor c) Metallic oxide semiconductord) Metallic oxygen semiconductor	1	CO-2
11	CMOS technology is used in _____ a) Inverterb) Microprocessor c) Digital logicd) b&c	1	CO-2
12	CMOS behaves as a/an _____ a) Adderb) Subtractorc) Inverterd) Comparator	1	CO-2
13	TTL circuits with “totem-pole” output stage minimize _____ a) The power dissipation in RTLb) The time consumption in RTL	2	CO-2

	c) The speed of transferring rate in RTL d) Propagation delay in RTL		
14	TTL is called transistor–transistor logic because both the logic gating function and the amplifying function are performed by _____ a) Resistors b) Bipolar junction transistors c) One transistor d) Resistors and transistors respectively	2	CO-2
15	The full form of CMOS is _____ a) Capacitive metal oxide semiconductor b) Capacitive metallic oxide semiconductor c) Complementary metal oxide semiconductor d) Complemented metal oxide semiconductor	1	CO-2
	FILL IN THE BLANKS	BT Level	Course Outcome
1	There are _____ cells in a 4-variable K-map	1	CO-2
2	Each product term of a group, w'.x.y' and w.y, represents the _____ in that group.	2	CO-2
3	Product-of-Sums expressions can be implemented using _____	2	CO-2
4	Don't care conditions can be used for simplifying Boolean expressions in _____	2	CO-2
5	It should be kept in mind that don't care terms should be used along with the terms that are present in _____	1	CO-2
6	These logic gates are widely used in _____ design and therefore are available in IC form.	2	CO-2
7	All input of NOR as low produces result as _____	2	CO-2
8	In RTL NOR gate, the output is at logic 1 only when all the inputs are at _____	2	CO-2
9	The minimum number of transistors can be used by 2 input AND gate is _____	2	CO-2
10	In DTL logic gating function is performed by _____	1	CO-2
11	In DTL amplifying function is performed by _____	3	CO-2
12	The full form of TCTL is _____	2	CO-2
13	TTL devices consume substantially _____ power than equivalent CMOS devices at rest.	2	CO-2
14	The speed of _____ circuits is limited by the tendency of common emitter circuits to go into saturation.	1	CO-2
15	Which insulating layer used in the fabrication of MOSFET _____	1	CO-2
	MATCH THE FOLLOWING		
1	MatchTheFollowing Questions A)2-variable K-map 1. 8-cells B)3-variable K-map 2.16-cells C)4-variable K-map 3.32-cells D) 5-variable K-map 4.4-cells	2	CO-2
2	MatchTheFollowing Questions A) V_{OH} max 1.Minimum input high level logic voltage B) V_{IH} min 2.Minimum output low level logic voltage C) V_{OL} min 3.Maximum input low level logic voltage D) V_{IL} max 4.Maximum output high level logic voltage	1	CO-2
3	MatchTheFollowing Questions A)The full form of TCTL 1. Complementary metal oxide semiconductor B)The full form of CMOS 2.Transistor-coupled transistor logic	3	CO-2

	C)The full form of TCTL3.Bipolar junction transistors D) The full form of BJT 4.Transistor-coupled transistor logic		
4	MatchTheFollowing Questions a) NAND 1.32CELLS b) 5-VARIABLE 2.16CELLS c) 4-VARIABLE 3.A'B+AB' a) EXCLUSIVE-OR 4.A'B'	2	CO-2
5	MatchTheFollowing Questions a)EXLUSIVE-OR 1.A'B' b) NAND 2.A'+B' c)NOR 3.A'B+AB' d)DON'TCARE 4.X	1	CO-2
	5 MARKS QUESTIONS	BT Level	Course Outcome
1	WhatisKarnaughmap?4-variablek-map?	3	CO-2
2.	DrawtheBooleanexpressionforK-mapf(A,B,C)= $\sum(0,2,5)$?	3	CO-2
3.	Simplify F(A,B,C,D) = $\Sigma m(4,5,6,7,12,13,14)$ using K-map	3	CO-2
4.	Simplify F(A,B,C,D) = $\Sigma \pi(0,1,3,6,8,9,10,12,13,15)$ using K-map	3	CO-2
5.	Explainaboutthe5-variablek-map?	1	CO-2
6.	Simplify F(A,B,C,D) = $\Sigma m(0,5,6,8,9,10,11,16,20,24,25,26,27,29,31)$ using K-map	5	CO-2
7.	Simplify F(A,B,C,D) = $\Sigma(4,5,6,7,12,13,14) +d(1,9,11,15)$ using K-map	3	CO-2
8	Reduce the following function using K-Map. F(A,B,C,D,E) = $\Sigma m(1,4,8,10,11,20,22,24,25,26)+d(0,12,16,17)$	2	CO-2
9	Design the AND,OR AND NOT gate using transistors.	5	CO-2
10	Draw the circuit of CMOS NOR gate and explain its operation. List some of the advantages of CMOS over other logic families.	3	CO-2
11	Explain about Fan-In, Fan-Out, Tri-state gate.	3	CO-2
12	Draw and explain the circuit of 2-input NAND and 2-input NOR gates using CMOS.	3	CO-2
13	Draw the symbol of CMOS transmission gate and write its advantages and applications.	3	CO-2
14	State advantages and disadvantages of TTL.	2	CO-2
15	Realize 2-input NAND using TTL logic	5	CO-2

UNIT-III

UNIT-III			
	MULTIPLE CHOICE QUESTIONS	BT Level	Course Outcome
1	Total number of inputs in a half adder is _____ a) 2b) 3c) 4d) 1	1	CO-3
2	In which operation carry is obtained? a) Subtractionb) Additionc) Multiplicationd) a&b	2	CO-3
3	If A and B are the inputs of a half adder, the sum is given by _____ a) A AND Bb) A OR Bc) A XOR Bd) A EX-NOR B	2	CO-3
4	How many AND, OR and EXOR gates are required for the configuration of full adder? a) 1, 2, 2b) 2, 1, 2c) 3, 1, 2d) 4, 0, 1	2	CO-3
5	Half subtractor is used to perform subtraction of _____ a) 2 bitsb) 3 bitsc) 4 bitsd) 5 bits	1	CO-3
6	The full form of SR is _____ a) System ratedb) Set resetc) Set readyd) Set Rated	2	CO-3
7	The full form of SR is _____ a) System ratedb) Set resetc) Set readyd) Set Rated	2	CO-3
8	The inputs of SR latch are _____ a) x and yb) a and bc) s and rd) j and k	2	CO-3
9	When a high is applied to the Set line of an SR latch, then _____ a) Q output goes highb) Q' output goes high c) Q output goes lowd) Both Q and Q' go high	2	CO-3
10	When both inputs of a J-K flip-flop cycle, the output will _____ a) Be invalidb) Changec) Not changed) Toggle	2	CO-3
11	Which of the following is correct for a gated D-type flip-flop? a) The Q output is either SET or RESET as soon as the D input goes HIGH or LOW b) The output complement follows the input when enabled c) Only one of the inputs can be HIGH at a time d) The output toggles if one of the inputs is held HIGH	1	CO-3
12	The sequential circuit is also called _____ a) Flip-flopb) Latchc) Strobed) Adder	2	CO-3
13	Whose operations are more faster among the following? a) Combinational circuitsb) Sequential circuits c) Latchesd) Flip-flops	2	CO-3
14	In S-R flip-flop, if Q = 0 the output is said to be _____ a) Setb) Resetc) Previous stated) Current state	2	CO-3
15	What is a multiplexer? a) It is a type of decoder which decodes several inputs and gives one output b) A multiplexer is a device which converts many signals into one c) It takes one input and results into many output d) It is a type of encoder which decodes several inputs and gives one output	1	CO-3
FILL IN THE BLANKS			
1	For subtracting 1 from 0, we use to take a _____ from neighbouring bits.	1	CO-3
2	Let the input of a subtractor is A and B then what the output will be if A = B _____	2	CO-3

3	The decimal number system represents the decimal number in the form of _____	2	CO-3
4	BCD adder can be constructed with 3 IC packages each of _____	2	CO-3
5	The addition of two decimal digits in BCD can be done through _____	1	CO-3
6	Why do we use gray codes _____	3	CO-3
7	The logic circuits whose outputs at any instant of time depends only on the present input but also on the past outputs are called _____	2	CO-3
8	How many types of sequential circuits are? _____	2	CO-3
9	In a multiplexer, the selection of a particular input line is controlled by _____	2	CO-3
10	How many NOT gates are required for the construction of a 4-to-1 multiplexer _____	2	CO-3
11	When both inputs of a J-K flip-flop cycle, the output will _____	2	CO-3
12	In a multiplexer, the selection of a particular input line is controlled by _____	1	CO-3
13	How many NOT gates are required for the construction of a 4-to-1 multiplexer _____	1	CO-3
14	The asynchronous input can be used to set the flip-flop to the _____	2	CO-3
15	D flip-flop is a circuit having _____	2	CO-3
MATCH THE FOLLOWING			
1	MatchTheFollowingQuestions a) T-FF 1.DELAY b) D-FF 2.TOGGLE c) JK-FF 3.SET-RESET d) SR-FF 4.JACKKILBY	2	CO-3
2	MatchTheFollowingQuestions a) latch 1.leveltriggering b) flip-flop 2.Edge-triggering c) register 3.Memoryelement d) counter 4.Store1bitinformation	1	CO-3
3	MatchTheFollowingQuestions a)multiplexer 1. $2^n:n$ b) encoder 2. $n:2^n$ c) decoder 3. $2n \times 1$ d) demultiplexer 4. 1×2^n	2	CO-3
4	MatchTheFollowingQuestions a) fulladder 1.combinationalcircuit b) shiftregister 2.sequentialcircuit c) flip flop 3.0or1 d) mux 4. 2×1	2	CO-3
5	MatchTheFollowingQuestions a) SET 1.0 b) RESET 2.1 c) TOGGLE 3.0or1	2	CO-3
5 MARKS QUESTIONS			
1	Design 32×1 Multiplexer using 8×1 Multiplexers and 2 to 4 decoder.	1	CO-3
2	Build the full adder using two half adders and logic gates with truth table?	5	CO-3
3	What is multiplexer? Design 8 to 1 mux using two 4 to 1 mux?	3	CO-3
4	What is comparator? Design & implement a 2-bit comparator using logic gates?	5	CO-3

5	Define combinational circuit?	3	CO-3
6	List the applications of multiplexer and demultiplexer	1	CO-3
7	Compare decoder and Demultiplexer?	3	CO-3
8	Draw the truth table of Half Subtractor?	5	CO-3
9	Explain the operation J-K master slave flip flop. Explain its truth table	3	CO-3
10	Construct the following functions using Multiplexer $F1 = m(2,3,6,8,12)$ $F2 = m(1,3,5,6,7,8,10)$		CO-3
11	What is Encoder? Design an octal to binary Encoder		CO-3
12	Find the characteristic equation for: i) T flip-flop ii) D flip-flop		CO-3
13	Using the method of flip flop conversion carry out S-R to T conversion		CO-3
14	Explain the conversion of SR flip flop into JK and D flip flop with an excitation table.		CO-3
15	With a neat circuit diagram and waveforms explain the operation of Master Slave JK flip flop.		CO-3

Unit – IV

MULTIPLE CHOICE QUESTIONS

		BT Level	Course Outcome
1	In digital logic, a counter is a device which _____ a) Counts the number of outputs b) Stores the number of times a particular event or process has occurred c) Stores the number of times a clock pulse rises and falls d) Counts the number of inputs	1	CO-3
2.	A counter circuit is usually constructed of _____ a) A number of latches connected in cascade form b) A number of NAND gates connected in cascade form c) A number of flip-flops connected in cascade d) A number of NOR gates connected in cascade form	2	CO-3
3	What is the maximum possible range of bit-count specifically in n-bit binary counter consisting of 'n' number of flip-flops? a) 0 to 2^n b) 0 to $2^n + 1$ c) 0 to $2^n - 1$ d) 0 to $2^{n+1/2}$	2	CO-3
4.	How many types of the counter are there? a) 2 b) 3 c) 4 d) 5	2	CO-3
5	A decimal counter has _____ states. a) 5 b) 10 c) 15 d) 20	1	CO-3
6.	Ripple counters are also called _____ a) SSI counters b) Asynchronous counters c) Synchronous counters d) VLSI counters	2	CO-3
7	Another way to connect devices to a shared data bus is to use a _____ a) Circulating gate b) Transceiver	2	CO-3

	c) Bidirectional encoder d) Strobed latch		
8.	What is the preset condition for a ring shift counter? a) All FFs set to 1 b) All FFs cleared to 0 c) A single 0, the rest 1 d) A single 1, the rest 0	1	CO-3
9.	What is the function of a buffer circuit? a) To provide an output that is inverted from that on the input b) To provide an output that is equal to its input c) To clean up the input d) To clean up the output	1	CO-3
10	What is a transceiver circuit? a) A buffer that transfers data from input to output b) A buffer that transfers data from output to input c) A buffer that can operate in both directions d) A buffer that can operate in one direction	2	CO-3
11	What is the difference between a shift-right register and a shift-left register? a) There is no difference b) The direction of the shift c) Propagation delay d) The clock input	2	CO-3
12	In serial shifting method, data shifting occurs _____ a) One bit at a time b) simultaneously c) Two bit at a time d) Four bit at a time	1	CO-3
13	A shift register is defined as _____ a) The register capable of shifting information to another register b) The register capable of shifting information either to the right or to the left c) The register capable of shifting information to the right only d) The register capable of shifting information to the left only	2	CO-3
14	A register that is used to store binary information is called _____ a) Data register b) Binary register c) Shift register d) D – Register	2	CO-3
15	Registers capable of shifting in one direction is _____ a) Universal shift register b) Unidirectional shift register c) Unipolar shift register d) Unique shift register	2	CO-3

FILL IN THE BLANKS

1	Three decade counter would have _____	2	CO-3
2	BCD counter is also known as _____	2	CO-3
3	The parallel outputs of a counter circuit represent the _____	2	CO-3
4	How many natural states will there be in a 4-bit ripple counter?	2	CO-3
5	A ripple counter's speed is limited by the propagation delay of _____	2	CO-3
6	Internal propagation delay of asynchronous counter is removed by _____	2	CO-3
7	How many flip-flops are required to construct a decade counter?	2	CO-3
8	How many different states does a 3-bit asynchronous counter have?	2	CO-3
9	An asynchronous 4-bit binary down counter changes from count 2 to count 3. How many transitional states are required?	2	CO-3
10	A ripple counter's speed is limited by the propagation delay of _____	2	CO-3
11	A 4-bit counter has a maximum modulus of _____	2	CO-3

12	A register is defined as _____	2	CO-3
13	The register is a type of _____	2	CO-3
14	How many types of registers are _____	2	CO-3
15	In D register, 'D' stands for _____	2	CO-3
MATCH THE FOLLOWING			
1	MatchTheFollowingQuestions a) Types of the counter 1. 10 b) A decimal counter 2. 3 c) Ripple counters 3.MSI counters d) Synchronous counter 4.Asynchronous counters	2	CO-3
2	MatchTheFollowingQuestions a) Three decade counter 1. Decade counter b) BCD counters 2. 3 BCD counters c) State of 4-bit ripples counter 3. 1001 d) Modulus-10 binary counter 4.16	2	CO-3
3	MatchTheFollowingQuestions a) 3-bit asynchronous counter 1. Sequential circuit b) The register is 2. 8 c) Types of registers 3. Binary register d) Binary information is called 4.4	2	CO-3
4	MatchTheFollowingQuestions a) Methods of shifting of data 1. One bit at a time b) In serial shifting method 2. 2 c) Transceiver circuit 3. To provide an output that is equal to its input d) Function of a buffer circuit 4.A buffer that can operate in both directions	1	CO-3
5	MatchTheFollowingQuestions a) Preset condition for a ring shift counter 1. Asynchronous b) Ripple counters 2. Synchronous counter c) Asynchronous counter is removed by 3. One bit at a time counters d) Binary information is called 4.A single 1, the rest 0	2	CO-3
5 MARKS QUESTIONS		BT Level	Course Outcome
1.	Explain the types of registers.	1	CO-3
2	Explain the operation of 4-bit shift right register .	4	CO-3
3.	Explain the operation of 4-bit shift left register.	4	CO-3
4	Explain the operation of 4-bit bi-directional shift register.	4	CO-3
5.	Explain the operation of ring counter	3	CO-3
6	Explain the operation of twisting ring counter	3	CO-3
7.	Explain the counters	2	CO-3
8.	Explain the operation of synchronous counter.	2	CO-3
9.	Explain the operation of asynchronous counter.	3	CO-3
10.	Explain the operation of 2-bit and 3-bit synchronous binary up counter.	6	CO-3

11	Explain the operation of 4-bit synchronous binary up counter.	6	CO-3
12	Discuss about the capabilities of Finite State Machines.	5	CO-3
13	Draw and explain the modulo N –counters.	5	CO-3
14	Explain the design of a serial binary adder	3	CO-3
15	Discuss about the approaches of designing synchronous sequential finite state machines.	2	CO-3

Unit – V

MULTIPLE CHOICE QUESTIONS		BT Level	Course Outcome
1	What are the basic limitations of finite state machine? (a) It cannot remember arbitrarily large amount of information (b) In cannot remember state transitions (c) In cannot remember grammar for a language (d) It cannot remember language generated from a grammar	2	CO-4
2	Moore Machine is an application of: a) Finite automata without input b) Finite automata with output c) Non Finite automata with output d) None of the mentioned	3	CO-4
3	In Moore machine, output is produced over the change of: a) Transitions b) States c) a & b d) None	3	CO-4
4	For a give Moore Machine, Given Input='101010', thus the output would be of length: a) Input +1 b) Input c) Input-1 d) Cannot be predicted	6	CO-4
5	The total number of states and transitions required to form a Moore machine that will produce residue mod 3. a) 3 and 6 b) 3 and 5 c) 2 and 4 d) 2 and 5	5	CO-4
6	Moore machine has _____ states than a mealy machine. a) Fewer b) More c) Equal d) Negligible	3	CO-4
7	State transition happens _____ in every clock cycle. a) Once b) Twice c) Thrice d) Four times	3	CO-4
8	In the FSM diagram, what does the information below the line in the circle represent? a) Change of state b) State c) Output value d) Initial state	4	CO-4
9	In the FSM diagram, what does arrow between the circles represent? a) Change of state b) State c) Output value d) Initial state	4	CO-4
10	In FSM diagram what does circle represent? a) Change of state b) State c) Output value d) Initial state	6	CO-4
11	What happens if the input is low in FSM? a) Change of state b) No transition in state c) Remains in a single state d) Invalid state	6	CO-4
12	A method used to specify the sequence of algorithm is a) Map b) Data c) Flowchart d) Operation	6	CO-4
13	Output values of Moore type FSM are determined by its _____ a) Input values b) Output values c) Clock input d) Current state	2	CO-4
14	One that is not present in the list of state table is a) Present state b) Input c) Next state d) Previous state	2	CO-4
15	Another possible method of control logic design is to use a) 1 flip-flop b) 2 flip-flop c) 1 flip-flop per state d) None	3	CO-4

FILL IN THE BLANKS		BT Level	Course Outcome
1	Binary information is classified into _____	2	CO-4
2	Difference in conventional flowchart and ASM chart is _____	2	CO-4
3	The logic design consists of _____	3	CO-4
4	Design ASM with multiplexers, is the method consists of _____	4	CO-4
5	Sequential circuit is also called _____	3	CO-4
6	ASM chart takes entire block as _____	3	CO-4

7	State box without decision and conditional box is _____	4	CO-4
8	ASM chart resembles with _____	3	CO-4
9	Control sequence state is indicated by _____	3	CO-4
10	If system is performing no function, then it is in _____	4	CO-4
11	ASM chart has _____	3	CO-4
12	ASM chart is composed of _____	5	CO-4
13	All inputs are synchronized with _____	5	CO-4
14	ASM chart is very same to _____	6	CO-4
15	For going to the next state flip-flop is set to _____	6	CO-4
MATCH THE FOLLOWING			
1	MatchTheFollowingQuestions a) Control implementation method 1. Latches b) The timing for all flip-flops in digital system is controlled 2. Impractical c) ASM chart is very same to 3.3 elements d) ASM chart is composed of 4.state diagram	3	CO-4
2	MatchTheFollowingQuestions a) Digital component 1. Algorithmic state machine b) ASM stands for 2. Encoder c) Discrete element of information is 3. State diagram d) ASM chart is a 4. Data	2	CO-4
3	MatchTheFollowingQuestions a) 3-bit asynchronous counter 1. Sequential circuit b) The register is 2. 8 c) Types of registers 3. Binary register d) Binary information is called 4.4	4	CO-4
4	MatchTheFollowingQuestions a) ASM chart entire block as 1. Simple block b) State ox without decision and condition box is 2. 1 unit c) ASM chart resemble with 3.State box d) Control sequence state indicated by 4.Flow chart	2	CO-4
5	MatchTheFollowingQuestions a) ASM chart has 1. Clock pulses b) ASM chart composed of 2. Any number exist c) All inputs are synchronized with 3.3 elements d) The logic design consists of 4.2 parts	4	CO-4
5 MARKS QUESTIONS			
		2	
1	Write the difference between Mealy and Moore type machines.	2	CO-4
2	Draw the circuit for the Moore machine.	6	CO-4
3	Explain the chart methods of minimal convertible.	4	CO-4
4	What are the limitations and capabilities of an FSM.	4	CO-4
5	Draw and explain the interaction between control logic and data path	6	CO-4

6	What is the difference between flow chart and ASM chart.	3	CO-4
7	Give the notation used in an ASM chart.	4	CO-4
8	State the salient features of ASM chart.	4	CO-4
9	Draw the ASM chart for weighing machine.	5	CO-4
10	Explain the data path subsystem for weighing machine	3	CO-4
11	Explain the control subsystem implementation of weighing machine.	3	CO-4
12	Write short note on PLA control.	2	CO-4
13	Explain the multiplexer method of implementing ASM charts.	4	CO-4
14	Explain the ASM technique of designing the sequential circuit.	4	CO-4
15	Explain the data subsystem and control subsystem.	4	CO-4

(For ECE)

Duration: 2 Hrs

Dt: 18-11-2023, Day-2 (FN)

Max Marks: 30M

Part – A

Answer **All** multiple choice questions.

Marks: 10Qx1/2M = 5M

* (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.)

		<u>*Blooms Taxonomy Levels</u>	<u>Course Outcomes</u>
1. According to Boolean law: $A+1=?$ A) 1 B) A C) 0 D) A'.	[]	II	CO1
2. $A(A+B)=?$ A) AB B) 1 C) (A+B) D) A	[]	II	CO1
3. Perform binary subtraction: $101111 - 010101 = ?$ A) 100100 B) 010101 C) 011010 D) 011001.	[]	V	CO1
4. In boolean algebra, the OR operation is performed by which properties? A) Associative properties B) Commutative properties C) Distributive properties D) All of the Mentioned.	[]	I	CO1
5. In DTL logic gating function is performed by. A) Diode B) Transistor C) Inductor D) Capacitor.	[]	I	CO2
6. The full form of MOS is. A) Metal oxide semiconductor B) Metal oxygen semiconductor C) Metallic oxide semiconductor D) Metallic oxygen semiconductor.	[]	I	CO2
7. All input of NOR as low produces result as. A) Low B) Mid C) High D) Floating.	[]	I	CO2
8. CMOS technology is used in. A) Inverter B) Microprocessor C) Digital logic D) B&C.	[]	I	CO2
9. Total number of inputs in a half adder is. A) 2 B) 3 C) 4 D) 1.	[]	I	CO3
10. In which operation carry is obtained? A) Subtraction B) Addition C) Multiplication D) A&B.	[]	II	CO3

Answer **All** fill in the blank questions.

Marks: 6Qx1/2M = 3M

11. The expression $Y=AB+BC+AC$ shows the _____ operation.		I	CO1
12. 2's complement of 11001011 is _____.		I	CO1
13. Octal to binary conversion: $(24)_8 =$ _____.		II	CO1
14. There are _____ cells in a 4-variable K-map		I	CO2
15. Product-of-Sums expressions can be implemented using _____.		II	CO2
16. For subtracting 1 from 0, we use to take a _____ from neighboring bits.		I	CO3

Answer **All** Match the following questions.

Marks: 2Qx1M = 2M

17.	$C+ABC+AB'C$	$A'+BC$	II	CO1
	$BC'+ABC+BC$	$A(B+C)$		
	$BC+AB'C+ABC'+ABC$	BC'		
	$B'+A'B+ABC$	$AB+BC+AC$		

counter consisting of 'n' number of flip-flops?

- A) 0 to 2^n B) 0 to $2^n + 1$ C) 0 to $2^n - 1$ D) 0 to $2^{n+1/2}$.

5. How many types of the counter are there? [] II CO3
 A) 2 B) 3 C) 4 D) 5.
6. Ripple counters are also called. [] II CO3
 A) SSI counters B) Asynchronous counters
 C) Synchronous counters D) VLSI counters.
7. What are the basic limitations of finite state machine? [] II CO4
 A) It cannot remember arbitrarily large amount of information
 B) It cannot remember state transitions
 C) It cannot remember grammar for a language
 D) It cannot remember language generated from a grammar.
8. For a give Moore Machine, Given Input='101010', thus the output would be of [] VI CO4
 length:
 A) |Input|+1 B) |Input| C) |Input-1| D) Cannot be predicted.
9. The total number of states and transitions required to form a Moore machine that [] V CO4
 will produce residue mod 3.
 A) 3 and 6 B) 3 and 5 C) 2 and 4 D) 2 and 5.
10. State transition happens _____ in every clock cycle. [] III CO4
 A) Once B) Twice C) Thrice D) Four times.

Answer All fill in the blank questions.

Marks: 6Qx1/2M = 3M

11. When both inputs of a J-K flip-flop cycle, the output will _____. II CO3
12. How many NOT gates are required for the construction of a 4-to-1 multiplexer _____. I CO3
13. Three decade counter would have _____. II CO3
14. BCD counter is also known as _____. II CO3
15. Binary information is classified into _____. II CO4
16. Difference between conventional flowchart and ASM chart is _____. II CO4

P.T.O.

Answer All Match the following questions.

Marks: 2Qx1M = 2M

17.

1. Full adder	a) Combinational circuit
2. Shift register	b) Sequential circuit
3. D flip-flop	c) 4
4. 4-bit	d) 1

 II CO3
18.

1. Types of the counter	a) 10
2. Decimal counter	b) 3
3. Ripple counters	c) MSI counters
4. Asynchronous counter	d) Asynchronous counters

 II CO3

Part – B

Answer any FOUR questions.

Marks: 4Qx5M = 20M

19. Write down the characteristic equation for the following: a) T flip-flop and b) D flip-flop. II CO3
20. Explain the conversion of SR flip flop into JK and D flip flop with an excitation table. IV CO3
21. Explain the types of registers. I CO3
22. Explain the operation of 4-bit shift right register. IV CO3

23. Draw the circuit for Moore machine and explain.
24. What are the limitations and capabilities of an FSM?

VI CO4

IV CO4

DATA STRUCTURES (R22CSE2112)

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

Course Outcomes	Statements
C212.1	Select the data structures that efficiently model the information in a problem. (Apply)
C212.2	Ability to assess efficiency trade-offs among different data structure implementations or combinations. (Analyze)
C212.3	Implement and know the application of algorithms for sorting and searching. (Analyze)
C212.4	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees (Apply)
C212.5	Ability to select the data structures that efficiently model the information in a problem (Analyze)
C212.6	Illustrate the concept of Text pattern matching algorithm (Evaluate)

Course Articulation Matrix:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C212.1	3	-	-	-	3	-	-	1	-	-	-	-	2	-	-
C212.2	1	3	3	-	-	-	-	1	-	-	-	-	-	2	-
C212.3	2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
C212.4	3	2	2	2	3	-	-	1	-	-	-	-	-	3	-
C212.5	-	2	3	-	1	-	-	1	1	-	-	2	-	-	-
C212.6	1	-	-	3	-	-	-	-	1	-	-	2	2	-	2
C212	2	2.5	2.75	2	2.33	-	-	1	1	-	-	1.66	2	2.5	2

DATA STRUCTURES

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - II Year – I Semester

L	T	P	C
3	0	0	3

(R22CSE2112) Data Structures

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

UNIT - I

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

UNIT - II

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT - III

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT - IV

Graphs: Graph Implementation Methods. Graph Traversal Methods. Sorting: Quick sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT - V

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXTBOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOKS:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning. R20 B.TECH.



SRI INDU COLLEGE OF ENGG & TECH
LESSON PLAN
 (Regulation: R22)
 Department of Information
 Technology

R22

Sub. Code & Title	R22CSE2112 Data Structures		
Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024	
Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT		

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
UNIT-I								
I	Introduction						16	
1.1	Introduction to Data Structures	R1	3	8	Black board	02		CO1, L1
1.2	Abstract data types	R1	9	15	Black board	01		CO1, L1
1.3	Linear list – singly linked list implementation	R1	193	194	PowerPoint Presentation	02		CO1, ,L2
1.4	Insertion, deletion and searching operations on linear list	R1	195	212	Black board	02		CO1, L2
1.5	Stacks-Operations, stack applications	R1	80	81	MODEL	02		CO1,L2
1.6	Array and linked representations of stacks	R1	83	89	Black board	02		CO1, L1
1.7	Queues-operations	R1	148	150	Black board	01		CO1, L2
1.8	Queues using array	R1	150	150	Black board	02		CO1,L2
1.9	Queues using Linked list	R1	151	158	Black board	02		CO1,L1
	Review	Signature of the HOD/Coordinator						
UNIT –II								
II	Dictionaries						10	
2.1	Dictionaries: linear list representation	T1	395	395	Black board	01		CO2, L1
2.2	skip list representation	T1			Black board	01		CO 2, L1
2.3	operations - insertion, deletion and searching	T1			Power point Presentation	01		CO 2, L2
2.3	Hash Table Representation: hash functions	R1	397	398	Power point Presentation	01		CO 2, L2
2.4	collision resolution-separate chaining	R1	620	621	Black board	02		CO2, L2
2.5	open addressing-linear probing	R1	623	624	Black board	02		CO 2, L3
2.6	quadratic probing, , double hashing	R1	625	625	Black board	01		CO2, L3
2.7	Rehashing, extendible hashing	R1			Black board	01		CO 2, L2

	Review	Signature of the HOD/Coordinator	
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Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT		

Uni t/ Ite m No.	To pic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handle d	CO/RBT
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**UNIT-
III**

III	Search Trees					09			
3.1	Search Trees: Binary Search Trees, Definition	T1	226	226	Seminar	02		CO4,L3	
3.2	Implementation, Operations- Searching, Insertion	T1	227	228	Black board	01		CO3, L4	
3.3	Deletion of elements	T1	230	231	Black board	01		CO3,L3	
3.4	AVL Trees, Definition, Height of an AVLTree	R1	341	342	Power point Presentation	01		CO3, L4	
3.5	Operations – Insertion, Deletion and Searching,	R1	348	348	Black board	01		CO4, L4	
3.6	Deletion and Searching,	R1	349	351	Black board	01		CO4, L3	
3.7	Red –Black	T1	518	525	Black board	01		CO4, L3	
3.8	Splay Trees	T1	542	542	Black board	01		CO4, L3	
	Review	Signature of the HOD/Coordinator							

**UNIT-
IV**

IV	Graphs					09			
4.1	Graphs: Graph Implementation	T1	257	263	Black board	01		CO4, L2	
4.2	Graph Traversal Methods	T1	272	273	Black board	02		CO4, L2	
4.3	Sorting: Quick Sort,Heap Sort	T1	347	347	Black board	02		CO3, L4	
4.4	External Sorting	T1	372	372	Black board	01		CO3, L4	
4.5	Model for external sorting	T1	376	376	Power point Presentation	02		CO3, L2	
4.6	Merge Sort	T1	335	335	Black board	01		CO3, L4	
	Review	Signature of the HOD/Coordinator							

**UNIT-
V**

V	Pattern Matching and tries					07		
5.1	Pattern Matching and Tries	T1	557	561	Black board	01		CO6,L3
5.2	the Boyer –Moore algorithm	W6	-	-	Power point Presentation	01		CO6, L4
5.3	the Knuth-Morris-Pratt algorithm	W7	-	-	Power point Presentation	02		CO6, L4
5.4	Standard Tries	W8	-	-	Black board	01		CO6, L6

5.5	Compressed Tries	W8	-	-	Black board	01		CO6, L6	
5.6	Suffix tries	W8	-	-	Black board	01		CO6, L6	
	Review	Signature of the HOD/Coordinator							

	SRI INDU COLLEGE OF ENGG & TECH LESSON PLAN (Regulation: R22) Department of Information Technology		R22
	Sub. Code & Title	R22CSE2112 Data Structures	
	Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024
	Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT	

LIST OF TEXT BOOKS AND REFERENCES

TEXT BOOKS:

- T1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
- T2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

- R1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage.

WEB LINKS

- W1 . <https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs25/>
- W2 . <https://nptel.ac.in/courses/106/105/106105085/>
- W3 . <https://nptel.ac.in/courses/106/105/106105085/>
- W4 . <https://www.coursera.org/specializations/data-structures-algorithms>
- W5 . <https://www.edx.org/course/data-structures-fundamentals>
- W6 <https://www.geeksforgeeks.org/boyer-moore-algorithm-for-pattern-searching/>
- W7 <https://www.geeksforgeeks.org/kmp-algorithm-for-pattern-searching/>
- W8 <https://www.geeksforgeeks.org/types-of-tries/>

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CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Binary Tree , Terminology and B+ Tree	NPTEL		Mrs. J.Sasirekha	PO1,PO4	PSO1
2	List implementation using Array	NPTEL		Mrs. J. Sasirekha	PO1	PSO1

ASSIGNMENT I & II

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1.	Explain the following data structures operations? a) Stack operations b) Queue operations	CO1	T2	11.12.22	13.12.22
2.	Describe Linked list? Distinguish between array and linked list?	CO1	T2	11.12.22	13.12.22
3.	Discuss the term Dictionary? What are the various applications of Dictionary and Hashing?	CO2	T2	11.12.22	13.12.22
4.	What are the various types of hash functions?	CO2	T1	11.12.22	13.12.22
5.	Write a procedure to perform insertion deletion and searching in Binary search tree?	CO4	T1	11.12.22	13.12.22
6.	a) Develop a program to insert the elements into AVL tree? b) Construction of AVL tree step by step with diagrams for the list {25,30, 35, 40, 50, 55, 60, 65, 70, 75}	CO4	T2	10.02.23	12.2.23
7.	Explain Breadth first search traversal with example?	CO3	T2	10.02.23	12.2.23
8.	Discuss about merge sort technique with suitable example?	CO3	T2	10.02.23	12.2.23



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S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
9.	Write and explain Boyer Moore pattern matching algorithm?	CO6	T2	10.02.23	12.2.23
10.	Calculate the failure function (or) prefix table in a search string "ABACAABADDCABACABAA BB".	CO6	T2	10.02.23	12.2.23

SELF STUDY TOPICS

S.No.	Topics	Books & Journals	Course Outcomes
1	Quick sort	Data structures through c by "yashvanth kanetkar"	CO1,CO3
2	Circular queue	Data structures through c by "yashvanth kanetkar"	CO1,CO2



SRI INDU COLLEGE OF ENGG & TECH QUESTION BANK (Regulation: R22) Department of Information Technology		R2 2
Sub. Code & Title	R22CSE2112 Data Structures	
Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024
Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT	

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

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

UNIT-1 : LINKED LISTS, STACK AND QUEUE			
	Multiple choice Questions	BT Level	Course Outcome
1	Which type of linked list stores the address of the first node in the next pointer of the last node? A) Singly Linked List B) Doubly Linked List C) Hashed List D) Circular Linked List		CO1
2	In which type of linked lists traversals can be performed in both directions? a) Singly Linked Lists b) Doubly Linked Lists c) Circular Linked Lists d) None of the above		CO1
3	Identify the data structure which allows deletions at both ends of the list but insertion at only one end. a) Stack b) Priority queues c) Output restricted queue d) Input restricted dequeue		CO1
4	Which of the following data structure is non linear type? a) Graph b) Stacks c) Lists d) None of the above		CO1
5	Which data structure is used in breadth first search of a graph to hold nodes? a) Array b) Tree c) Stack d) queue		CO1

6	When new data are to be inserted into a data structure, but there is not available space; this situation is usually called		CO1
	<ul style="list-style-type: none"> a) overflow b) Underflow c) housefull d) memory full 		
7	What is a data structure?		CO1
	<ul style="list-style-type: none"> a) A programming language b) A collection of algorithms c) A way to store and organize data d) A type of computer hardware 		
8	Which data structure is based on the Last In First Out (LIFO) principle?		CO1
	<ul style="list-style-type: none"> a) Tree b) Linked List c) Stack d) Queue 		
9	Which of the following statement(s) about stack data structure is/are NOT correct?		CO1
	<ul style="list-style-type: none"> a) Top of the Stack always contain the new node b) Stack is the FIFO data structure c) Null link is present in the last node at the bottom of the stack d) Linked List are used for implementing Stacks 		
10	Which data structure is needed to convert infix notation to postfix notation?		CO1
	<ul style="list-style-type: none"> a) Tree b) Branch c) Stack d) Queue 		
11	What is the value of the postfix expression 6 3 2 4 + - *?		CO1
	<ul style="list-style-type: none"> a) 74 b) -18 c) 22 d) 40 		
12	The data structure required for Depth First Traversal on a graph is?		CO1
	<ul style="list-style-type: none"> a) Array b) Stack c) Tree 		

	d) Queue		
13	A data structure in which elements can be inserted or deleted at/from both ends but not in the middle is? a) Priority queue b) Dequeue c) Circular queue d) Queue		CO1
14	What is the time complexity to count the number of elements in the linked list? a) O(1) b) O(n) c) O(logn) d) O(n ²)		CO1
15	In a circular queue, how do you increment the rear end of the queue? a) rear++ b) (rear+1) % CAPACITY c) (rear % CAPACITY)+1 d) rear--		CO1

Fill in the blanks

1	Stack and Queue are----- data structures.		CO1
2	----- data structure is used to evaluate postfix expression.		CO1
1F-3	Types of linked lists are -----		CO1
1F-4	----- Condition indicates Stack underflow.		CO1
1F-5	Queue is full when -----		CO1
1F-6	Draw the example circular linked list -----		CO1
1F-7	Advantage of a circular queue is -----		CO1
1F-8	Operations on stack are -----		CO1
1F-9	Differences between single and double linked list are-----		CO1
1F-10	Disadvantage of linked lists are -----		CO1
1F-11	----- Pointers, double linked list node will have.		CO1

1F-12	----- is the condition to become a queue full.		CO1
1F-13	----- is the condition that specifies a queue contains single element.		CO1
1F-14	Types of queues are -----		CO1
1F-15	Applications of Queue are -----		CO1

Match the following

1	Match the following a) Linear data structures b) Stack c) Applications of Stack d) Dequeue	i) LIFO list ii) Insertion and Deletion can be done from both ends iii) Stack ,Queue iv) Evaluating postfix expression		CO1
2	Match the following a. Array b. Stack c. Queue d. Linked list	1. Insertion and deletion at different ends 2. Insertion and deletion at the same end 3. Self-referential structure is utilized 4. Elements are accessed by specifying its position		CO1
3	a. Stack b. Queue c. Priority queue d. Double linked list	1. Traverse in both directions. 2. Event driven simulation 3. Operation for the printer 4. Balanced parenthesis verification		CO1
4	a) Queue b) Tree c) Stack d) Linear data structure	1.DFS 2.LIFO list 3.Stack 4.Non Linear data structure		CO1
5	a) Linear Queue b) Circular Queue c) Double Linked List d) Single Linked List	1. Node will have two pointers 2.Memory wastage 3. Node contains one pointer 4. Efficient utilization of memory		CO1

5 - MARKS QUESTIONS

1	Discuss about implementation of single linked list?	II	CO1
2	Write a program to implement single linked list?	VI	CO1
3	Explain the following data structures a)Stack operations b)Queue operations	II	CO1

1	Write about Stack representation using array and linked list?
2	Write about Queue representation using array and linked list?
3	Write a program to implement stack using Linked list?
4	Write a program to implement Queue using array?
5	Explain about Stack applications and Queue applications.
6	Describe Linked list? Distinguish between array and linked list?
7	Explain about following a) Data structure b) Abstract Data Type c) Linear data structure d) Non Linear Data structure.
8	Write the advantages of linked lists. Write an algorithm to insert and delete a node in singlelinked list.
9	Explain any two applications of stack with examples.
10	Compare Single linked list with Double linked list.
11	Define Data Structure. Write a brief note on different data structures with examples.
12	What are the limitations of Linear Queue. Explain operations of Circular queue.



SRI INDU COLLEGE OF ENGG & TECH
QUESTION BANK
 (Regulation: R22)
 Department of Information
 Technology

R22

Sub. Code & Title	R22CSE2112 Data Structures		
Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024	
Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

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

UNIT - II			
OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS		BT Level	Course Outcome
1.	Coulomb's law depends on a) line joining the two point charges b) directly proportional to product of two point charges c) inversely proportional to square of distance between two point charges d) all of the above	2	CO1
2.	A vector has a) magnitude b) direction c) both d) none of the above	1	CO1
3.	Electric field intensity is a) A vector b) A scalar c) both vector and a scalar d) neither a vector nor a scalar	1	CO1
4.	Force exerted per unit charge is called a) magnetic field intensity b) electric field intensity c) both electrical and magnetic field intensities d) none of the above	1	CO1
5.	A scalar has a) magnitude b) direction c) both d) none of the above	2	CO1
6.	Distance vector is otherwise called as a) separation vector b) long vector c) unit vector d) none of the above	2	CO1
7.	Base vector is a a) separation vector b) long vector c) unit vector d) none of the above	1	CO1
8.	The electric flux passing through any closed loop is equal to total charge enclosed is given by a) Poisson's law b) ohm's law c) Kirchoff's law d) gauss law	1	CO1
9.	Cartesian co-ordinate system is otherwise called as a) square co-ordinate system b) hyperbola co-ordinate system c) rectangular co-	2	CO1

	ordinate system d) none of the above		
10.	Dot product obeys a) commutative law b) distributive law c) both d) none of the above	2	CO1
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	A field is a region in which a particular physical function has a value at -----	2	CO1
2.	A vector is defined by -----	1	CO1
3.	Permittivity is measured in -----	1	CO1
4.	The dimensions of a surface carrying charge is very very less as compared to its region is called -----	2	CO1
5.	Displacement flux is otherwise called as -----	2	CO1
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome
1.	1. charge per metre is 2. charge per cubic metres 3. electric flux 4. surface integral	a) ρ_s b) ψ c) ρ_v d) ρ_l	1 CO1
2.	1. ϵ_0 is 2. cross product is denoted by 3. scalar has 4. cross product has direction	a) 90° angle b) magnitude only c) $1/36\pi$ d) $A \times B$	2 CO1
3.	1. electric field intensity is measured in 2. vector has 3. coulomb's law is measured 4. Farad/meter is	a) coulomb ² /Newton metre ² b) ϵ_0 c) direction d) Newton/coulomb	1 CO1
4.	1. Cartesian system has 2. electric dipole is 3. permittivity is 4. unit vector has	a) base vector b) $\epsilon_0\epsilon_r$ c) right handed system d) two opposite charges	1 CO1
5.	1. $\text{div } \vec{D}$ is 2. net flux over the surface is 3. Units of \vec{E} is 4. principle of superposition is applied in	a) zero b) Newton/coulomb c) coulomb's law d) ρ_v	2 CO1
PART B			
5 MARKS QUESTIONS			
1	What are the two methods of representing Liner list? Explain with example DEC 2012	1	CO2
2	Write about Hash table and Hash function? DEC 2016	3	CO2
3	What are the various types of hash functions?	1	CO2
4	Demonstrate skip list representation and its node structure with example? Oct 2021 Nov 2019	3	CO2
5	Explain a) How does collision occur? Mar 2021 Oct 2020 b) Explain chaining and open addressing methods for detecting collision and overflow?	2	CO1,CO2
6	Write about following collision handling techniques? a) Quadratic Probing b) Double hashing Mar 2021	3	CO2

7	Discuss about the Rehashing Technique and its advantages?	2	CO2
8	Explain the concept of extensible hashing with suitable example	2	CO2
9	What is hashing? Explain the differentiation between hashing and skip list? DEC 2013	2	CO2
10	Discuss the term Dictionary? What are the various applications of Dictionary and Hashing?	3	CO1,CO2



SRI INDU COLLEGE OF ENGG & TECH
QUESTION BANK
 (Regulation: R22)
 Department of Information
 Technology

R2
2

Sub. Code & Title	R22CSE2112 Data Structures		
Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024	
Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

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

UNIT - III			
OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS		BT Level	Course Outcome
1.	Coulomb's law depends on a) line joining the two point charges b) directly proportional to product of two point charges c) inversely proportional to square of distance between two point charges d) all of the above	2	CO1
2.	A vector has a) magnitude b) direction c) both d) none of the above	1	CO1
3.	Electric field intensity is a) A vector b) A scalar c) both vector and a scalar d) neither a vector nor a scalar	1	CO1
4.	Force exerted per unit charge is called a) magnetic field intensity b) electric field intensity c) both electrical and magnetic field intensities d) none of the above	1	CO1
5.	A scalar has a) magnitude b) direction c) both d) none of the above	2	CO1
6.	Distance vector is otherwise called as a) separation vector b) long vector c) unit vector d) none of the above	2	CO1
7.	Base vector is a a) separation vector b) long vector c) unit vector d) none of the above	1	CO1
8.	The electric flux passing through any closed loop is equal to total charge enclosed is given by a) Poisson's law b) ohm's law c) Kirchoff's law d) gauss law	1	CO1
9.	Cartesian co-ordinate system is otherwise called as a) square co-ordinate system b) hyperbola co-ordinate system c) rectangular co-	2	CO1

	ordinate system d) none of the above		
10.	Dot product obeys a) commutative law b) distributive law c) both d) none of the above	2	CO1
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	A field is a region in which a particular physical function has a value at -----	2	CO1
2.	A vector is defined by -----	1	CO1
3.	Permittivity is measured in -----	1	CO1
4.	The dimensions of a surface carrying charge is very very less as compared to its region is called -----	2	CO1
5.	Displacement flux is otherwise called as -----	2	CO1
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome
1.	5. charge per metre is 6. charge per cubic metres 7. electric flux 8. surface integral	a) ρ_s b) ψ c) ρ_v d) ρ_l	1 CO1
2.	5. ϵ_0 is 6. cross product is denoted by 7. scalar has 8. cross product has direction	a) 90° angle b) magnitude only c) $1/36\pi$ d) $A \times B$	2 CO1
3.	5. electric field intensity is measured in 6. vector has 7. coulomb's law is measured 8. Farad/meter is	a) coulomb ² /Newton metre ² b) ϵ_0 c) direction d) Newton/coulomb	1 CO1
4.	5. Cartesian system has 6. electric dipole is 7. permittivity is 8. unit vector has	a) base vector b) $\epsilon_0\epsilon_r$ c) right handed system d) two opposite charges	1 CO1
5.	5. $\text{div } \vec{D}$ is 6. net flux over the surface is 7. Units of \vec{E} is 8. principle of superposition is applied in	a) zero b) Newton/coulomb c) coulomb's law d) ρ_v	2 CO1

PART B

5 MARKS QUESTIONS

1	Write a procedure to perform insertion deletion and searching in Binary search Tree?	6	CO2,CO3
2	Explain in detail deletion of an element in BST in different cases?	2	CO1,CO4
3	Write a program to perform following operations in Binary search tree? a) Insert an element into a binary search tree b) Delete an element from a binary search tree OCT 2020	6	CO1,CO4
4	Define Binary search tree? Construct binary search tree step by step with diagrams using list of numbers {4,5,1,2,9,7,3,6,10,12,11}. July 2021	6	CO1,CO4
5	Describe AVL Tree? Illustrate different rotations in AVL tree for balancing with appropriate example? Nov 2019	4	CO4
6	Write list of operations perform on AVL tree with example? Mar 2021	3	CO4

7	a) Explain a balance factor in AVL tree with example? b) Explain representation of AVL tree with example?	2	CO4
8	a) Develop a program to insert the elements into AVL tree? b) Construction of AVL tree step by step with diagrams for the list {25, 30, 35, 40, 50, 55, 60, 65, 70, 75}. DEC 2011 DEC 2018	6	CO4
9	Illustrate Red-Black tree with example?	4	CO1,CO4
10	Illustrate Splay-tree with example? Oct 2021	4	CO1,CO4



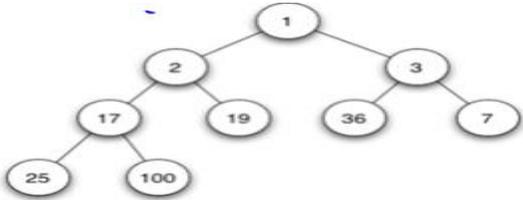
SRI INDU COLLEGE OF ENGG & TECH
QUESTION BANK
 (Regulation: R22)
 Department of Information
 Technology

R2
2

Sub. Code & Title	R22CSE2112 Data Structures		
Academic Year: 2023-2024	Year/Sem./Section	Academic Year: 2023-2024	
Faculty Name & Designation	Mrs. S.Geetha, Assistant Professor/IT		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

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

UNIT - IV			
OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS		BT Level	Course Outcome
1.	Which of the following sorting algorithms can be used to sort a random linked list with minimum time complexity? a. insertion sort b. quick sort c. heap sort d. merge sort	2	CO1
2.	In a max-heap, element with the greatest key is always in the which node? a) leaf node b) first node of left sub tree c) root node d) first node of right sub tree	1	CO1
3.	Heap can be used as _____ a) priority queue b) stack c) a decreasing order array d) none of the mentione	1	CO1
4.	If we implement heap as min-heap , deleting root node (value 1)from the heap. What would be the value of root node after second iteration if leaf node (value 100) is chosen to replace the root at start.  a) 2 b) 100 c) 17 d) 3	4	CO1

5	A sorting technique is called stable if it a) Takes $O(n \log n)$ times b) Maintains the relative order of occurrence of non-distinct elements c) Uses divide-and-conquer paradigm d) Takes $O(n)$ space	2	CO1
6.	Descending priority queue can be implemented using _____ a) max heap b) min heap c) min-max heap d) trie	2	CO1
7.	Min heap can be used to implement selection sort. a) true b) false	1	CO1
8.	Which one of the following array elements represents a binary min heap? a) 12 10 8 25 14 17 b) 8 10 12 25 14 17 c) 25 17 14 12 10 8 d) 14 17 25 10 12 8	4	CO1
9	The time complexity of a quick sort algorithm which makes use of median, found by an $O(n)$ algorithm, as pivot element is a) $O(n^2)$ b) $O(n \log n)$ c) $O(n \log \log n)$ d) $O(n)$	1	CO1
10	If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance? a) Insertion sort b) Selection sort c) Quick sort d) Merge sort	3	CO1
11	The time complexity of heap sort in worst case is a) $O(\log n)$ b) $O(n)$ c) $O(n \log n)$ d) $O(n^2)$	5	CO1
12	Counting sort performs Numbers of comparisons between input elements. a) 0 b) n c) $n \log n$ d) n^2	1	CO1
13	Which of the following sorting algorithm has the running time that is least dependant on the initial ordering of the input? a) Insertion sort b) Quick sort c) Merge sort d) Selection sort	1	CO1

14	In a binary min heap containing n elements, the largest element can be found in _____ time. a) $O(n)$ b) $O(n \log n)$ c) $O(\log n)$ d) $O(1)$	2	CO1
15	Which of the following sorting algorithms in its typical implementation gives best performance when applied on an array which is sorted or almost sorted (maximum 1 or two elements are misplaced) a) quick sort b) heap sort c) merge sort d) insertion sort	1	CO1

	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	----- Method is used to create an empty graph	2	CO1
2.	----- Is an external sorting algorithm which makes a use of secondary storage	1	CO1
3.	The best case time complexity of merge sort algorithm is -----	1	CO1
4.	A pair of nodes connected by a line segment is called -----	2	CO1
5.	The minimum number of vertices that a cyclic graph posses is -----	2	CO1
6	The standard graphs,traversals are -----	1	CO1
7	In an undirected graph,the sum of degrees of all the must be -----	2	CO1
8	Heap sort belongs to the family of sorting by -----	1	CO1
9	A ----- can be used for multi-way merge	1	CO1
10	-----Algorithm design technique is used in the quick sort algorithm?	1	CO1
11	For merging two sorted lists of size m and n into sorted list of size m+n, we require comparisons of-----	5	CO1
12	A sorting technique is called stable if it-----	1	CO1
13	----- the worst method of choosing a pivot elemen	3	CO1
14	Quick sort follows-----	1	CO1
15	The -----traversal of a graph traverses all decedents of a node before moving to anadjacent node	1	CO1
	MATCHTHEFOLLOWING 1MARK QUESTIONS	BT Level	Course Outcome
1.	1.Breadth first search 2.Depth first search 3.Prim’s algorithm 4.Kruskal minimum spanning tree	a) stack b) priority queue c) union find d) queue	1 CO1

2.	1.Merge sort 2.Heap sort 3.Quick sor 4.Insertion sort	a) sort small number of elements b) sort linked list c) information searching d) find smallest and largest number	2	CO1
3.	1.Quick sort 2.Task scheduling 3.Merge sort 4.Prims's	a) divide and conquer algorithm b) greedy programming c) dynamic programming algorithm d) not stable algorithm	1	CO1
4.	1.merge sort 2.heap sort 3.cycle sort 4.shell sort	a) diminishing increment algorithm b) divide and conquer algorithm c) unstable sorting algorithm d) priority queue algorithm	1	CO1

PART B
5 MARKS QUESTIONS

1	Write about various graph representation techniques?	3	CO4
2	Classify the types of graphs? Explain basic terminologies in graph?	2	CO4
3	Explain Breadth first search traversal with example?	2	CO5, CO4
4	Explain Depth first search traversal with example?	2	CO5, CO4
5	Write a program to implement breadth first search?	6	CO5, CO3
6	Write a program to implement depth first search?	6	CO5, CO4
7	Explain about heap sort with example?	2	CO3
8	Explain external sorting model for external sorting?	2	CO3
9	Discuss about merge sort technique with suitable example?	2	CO3
10	Explain about external sorting with an example.	2	CO3
11	Explain about quick sort technique with suitable example?	2	CO3
12	a) Distinguish between quick sort and merge sort? b)What are applications of quick sort and merge sort?	4	CO3
13	Differentiate between BFS and DFS.	4	CO3
14	Write the advantages and disadvantages of quick sort	2	CO3
15	b) Distinguish between heap sort and merge sort? c) What are applications of heap sort and merge sort?	4	CO3

9	<p>What can be the maximum depth of the trie with n strings and m as the maximum string the length?</p> <p>a) $\log_2 n$ b) $\log_2 m$ c) n d) m</p>	2	CO1
10	<p>A program to search a contact from phone directory can be implemented efficiently using _____</p> <p>a) a BST b) a trie c) a balanced BST d) a binary tree</p>	2	CO1
11	<p>What is the auxiliary space complexity of Z algorithm for pattern searching (m = length of text, n = length of pattern)?</p> <p>a) $O(n + m)$ b) $O(m)$ c) $O(n)$ d) $O(m * n)$</p>	1	
12	<p>Which of the following is not true?</p> <p>a) Trie requires less storage space than hashing b) Trie allows listing of all the words with same prefix c) Tries are collision free d) Trie is also known as prefix tree</p>	4	
13	<p>Which of the following is true about the trie?</p> <p>a) root is letter a b) path from root to the leaf yields the string c) children of nodes are randomly ordered d) each node stores the associated keys</p>	4	
14	<p>Which of the following special type of trie is used for fast searching of the full texts?</p> <p>a) Ctrie b) Hash tree c) Suffix tree d) T tree</p>	1	
15	<p>Auto complete and spell checkers can be implemented efficiently using the trie.</p> <p>a) True b) False</p>	1	

	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	-----function is used to prevent backtracking on a string.	2	CO1
2.	The term trie is derived from the word -----	1	CO1
3.	The number of nodes in a tree is -----	1	CO1
4.	A standard trie has a binary structure when the alphabet has only -----channels	2	CO1
5.	-----structure is useful when the size of key values vary	2	CO1
6	-----support search, insert and delete operations in $O(d-m)$ time	1	CO1
7	-----eliminates the character of nodes	1	CO1
8	In -----method, traversal is started from a given vertex V in the graph	2	CO1
9	Heap can be classified as -----	1	CO1
10	Trie is also known as-----	1	
11	A program to search a contact from phone directory can be implemented efficiently using-----	2	
12	construction of suffix trie take-----	4	
13	-----can be the maximum depth of the trie with n strings and m as the maximum string length	4	
14	-----type of trie is used for fast searching of the full texts	1	
15	-----structure is useful when the size of key values varies	1	CO1
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome
1.	1.Prim's algorithm 2.Dijkstra's algorithm 3.Faster all pairs shortest path 4.Edmonds-karp algorithm	a) $O(V^2 \log V)$ b) $O(VE^2)$ c) $O(ELGV)$ d) $O(V^2)$	1 CO1

2.	1. Pattern matching 2. Navi based algorithm 3. Boye moor algorithm 4. Knuth-morries pptern 5. Tries	a) brute force algorithm b) search string notepad c) supports fast string matching d) backward approach e) compares character left -right	2	CO1
3.	1. O(n) 2. Suffix trie 3. Labeled edge 4. Compressed trie	b) eliminates character of a nodes c) compressed trie with an extra field d) number of nodes in a trie e) assign inoties	1	CO1
4.	1. Trie 2. Binary trie structures 3. C standard function 4. Number of nodes in a trie	a) O(N) b) derived from retrival c) alphabets have two characters d) stdio.h	1	CO1
5.	1. Suffix tries 2. Standard tries 3. Compressed tries 4. Trie data structure	a) used to activate space optimization b) based on prefix of string c) faster insertion d) ordered tree data structure	2	CO1

PART B
5 MARKS QUESTIONS

1	Discuss about various types of tries.	2	CO1
2	Write an algorithm of Standard Trie.	2	
3	Write and explain Boyer Moore pattern matching algorithm?	6	CO6
4	Explain the features that distinguish between Boyer Moore algorithm from the conventional algorithms.	2	CO1,CO6
5	Write and explain Knuth-Morris-pratt pattern matching algorithm?	6	CO1,CO6
6	Discuss Knuth Morris Pratt (KMP) algorithm. Compute whether the pattern P=10100111 is present in the string T=1001010100111 or not.	5	CO1,CO6
7	What are the advantages of trie? Compare trie with Hash table?	4	CO6
8	Explain about the compressed trie with an example.	2	CO6
9	Calculate the failure function (or) prefix table in a search string "ABACAABADCABACABAABB".	6	CO6
10	Differentiate standard tries and compressed tries?	4	CO6
11	Explain the Brute-force algorithm with an example	2	CO1,CO6
12	Explain about the Suffix tries with an example.	2	CO6
13	Write an algorithm of compressed trie	6	CO1
14	Write an algorithm of standard trie	6	CO1
15	Draw the Standard Trie and Compressed Trie for the following String { area, array, aim, acid, act, rest, rate, ratio }	6	CO6

PREVIOUS YEAR QUESTION PAPERS

BR-18

HallTicket No.: _____

D4

Subject Code: R18CSE2101

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

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

II B.Tech – I Semester – (Regular) End Examinations - November - 2019

DATA STRUCTURES

(Common to CSE, IT)

Duration: 3 Hrs

06.11.2019

Max Marks: 70M

Section – A

Answer All the following questions

Marks: 5Qx4M =

20M

1. Evaluate the following postfix expression $632-*+1\$7+$.
2. Compare AVL tree and Red black tree.
3. Write the pseudocode to find the height of AVL tree.
4. Describe external sorting with example.
5. Write the standard trie for the set of strings $S = \{ \text{bear, bell, bid, bull, buy, sell, stock, stop} \}$.

Section – B

Answer any FIVE questions choosing at least one from each Unit

Marks: 5Qx10M =

50M

UNIT : I

6. Write a C program to implement stack using linked list representation.
(OR)
7. Write a c Program to convert given infix expression to postfix form using stack.

UNIT : II

8. Explain Searching an element in Skip list with an example and also write Pseudo code for the same.

(OR)

9. Explain with an suitable example of Extendible Hashing.

UNIT : III

10. Write a C program to construct binary search tree from the given data 4,6,8,2,5,1,7,3.

(OR)

11. Describe AVL Tree? Illustrate different rotations in AVL tree for balancing with appropriate example.

UNIT : IV

12. Construct a binary search tree from the given data 7,5,3,6,2,1,8,4,9 and perform in-order, pre-order and post-order traversal.

(OR)

13. Explain the working of merge sort with pseudocode. Sort the given elements 5,3,9,1,2,8,4,6 using merge sort technique.

UNIT : V

14. Explain working of Boyer Moore Algorithm with an suitable example.

(OR)

15. Explain Knuth-Morris-pratt pattern matching algorithm with an example.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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

II B.Tech - I Semester –End Examinations (Suppl.) October-2020**R18CSE2101 – DATA STRUCTURES**

(Common to CSE & IT)

Duration:2 Hrs**14.10.2020 (FN)****Max Marks:70M****Section – A****Answer Any Three of the following questions.****Marks: 3Qx6M =18M**

1. Write the postfix form of given infix expression $a^b+(c*d-e+(f/g+h)/i)^j/k^l$.
2. Discuss splay trees with an example.
3. List the different methods for collision resolution
4. Explain external sorting with example.
5. Mention the applications of suffix trie.

Section – B**Answer FOUR questions from the following****Marks: 4Qx13M = 52M****UNIT – I**

6. Write a C program to implement basic operation of queue using linked list representation .

(OR)

7. Write a C Program to evaluate given postfix expression using stack .

UNIT - II

8. Explain deleting an element in Skip list representation .Also write Pseudo code for the same

(OR)

9. Explain the separate chaining in detail. Use the hash function "key mod 7", to insert the following sequence of keys in the hash table 50, 700, 76, 85, 92, 73,101.Use separate chaining technique for collision resolution.

UNIT - III

10. Explain in detail deletion of an element in BST in different cases.

(OR)

11. Illustrate red black trees with an example . Mention its advantages. Compare it with AVL trees

UNIT - IV

12. Construct a binary search tree from the given data 8,9,3,6,2,1,7,4,5 and perform in-order ,pre-order and post -order traversal .

(OR)

13. Explain the working of heap sort .Sort the given elements 5,3,9,1,2,8,4,7,6 using heap sort technique

UNIT-V

14. Explain the Brute-force pattern matching algorithm with an example..

(OR)

15. Explain Knuth-Morris-pratt pattern matching algorithm with an example.



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1956

II B.Tech I Semester (Reg./Suppl.) End Examinations March - 2021

DATA STRUCTURES

10 /03/2021

(Common to CSE and IT)

Day- 2

Duration: 3 Hrs

Marks: 5Qx14M =

70M

Answer **FIVE** questions (Treat Q.No.11 as a single question).

UNIT-I

1. Write a program in C to create two queues using linked list and identify which queue is having more number of elements and search a given element is present in both queues.

(OR)

2. Given an array arr[] of n elements, write a function to search a given element x in arr[].
Input : arr[] = {10, 20, 80, 30, 60, 50, 110, 100, 130, 170}
X=130
Output : ?
Implement the above concepts using C Program.

UNIT-II

3. Using the hash function 'key mod 7', insert the following sequence of keys in the hash table-
50, 700, 76, 85, 92, 73 and 101
Use separate chaining technique for collision resolution.

(OR)

4. Assuming the table size as the smallest prime number greater than the input size, hash the following keys: [52, 66, 35, 04, 68, 34, 26, 19, 29]. To handle collision, use
a) Linear probing and
b) Quadratic probing. Which of the two methods has less number of total Probes?

UNIT-III

5. Write a procedure (no code required) to delete a node from a AVL tree with suitable examples and neat figures.

(OR)

6. a) Construct a Binary Search Tree for the following order of input (step by step construction is expected) [40, 29, 12, 34, 78, 54, 90, 57, 77, 44, 23, 11, 8, 19] [7].
b) Traverse the above BST through Inorder, Postorder and Preorder.

UNIT-IV

7. With Example explain the following:
a) Breadth first Traversal.
b) Depth first Traversal.

(OR)

8. Sort the following data using (MAX) heapsort: [20, 12, 35, 15, 10, 80, 30] and illustrate with appropriate figures for each iteration.

UNIT-V

9. How to build a Suffix Tree for a given text? Also explain how to search a pattern in the built suffix tree.
"AndroidOS\0".

(OR)

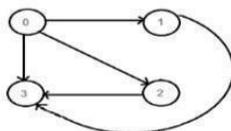
10. Explain how Knuth Morris Pratt string Search Algorithm are performed with the example String pattern.

P.T.O.

11. Answer any **THREE** questions from the following.

(5M+5M+4M)

- a) Write down the algorithm for inserting the value at the beginning of the queue?
b) What do you mean by collision resolution in hashing technique?
c) Mention how Zig-Zig and Zag-Zag rotations are performed in the splay tree.
d) Find the number of paths of length K in a directed graph for the following.



- e) Define how brute force approach is used to search the value. Specify its best and worst case time complexities.

**BR-18
D4**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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

**II B.Tech - I Semester - I Mid Term Examinations, August - 2019
(R18CSE2101) DATA STRUCTURES - (Common to CSE & IT)**

**Duration: 90Mins
25M**

Dt: 26.08.2019 AN

Max Marks:

Section – A

**Answer All the questions
5Qx1M = 5M**

Marks:

1. Explain the advantages and disadvantages of linked list.
2. Explain the applications of Linked list.
3. Define double hashing?
4. Define collision.
5. List the operations in Binary Search Tree.

Section – B

Answer any FOUR questions

4Qx5M = 20M

Marks:

6. Discuss about implementation of single linked list.
7. Explain the following data structures operations a) Stack operations b) Queue operations.
8. Write about Queue representation using array and linked list.
9. What are the two methods of representing Linear list? Explain with example.
10. Write about Hash table and Hash function.
11. Write a procedure to perform insertion deletion and searching in Binary search tree.

**BR-18
D4**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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

**II B.Tech - I Semester - II Mid Term Examinations
(R18CSE2101) DATA STRUCTURES - (Common to CSE & IT)**

**Duration: 90Mins
25M**

Dt: 30.10.2019 AN

Max Marks:

Section – A

**Answer All the questions
5Qx1M = 5M**

Marks:

1. List the rules of Red-Black Tree?
2. Define complete graph and weighted graph.
3. Describe external sorting.
4. What are the different types of Pattern Matching Algorithms?
5. What are the applications of pattern matching?

Section – B

Answer any FOUR questions

4Qx5M = 20M

Marks:

6. Illustrate Red-Black tree with example?
7. Illustrate Splay-tree with example.
8. Explain Depth first search traversal with example.
9. Discuss about merge sort technique with suitable example.
10. Explain about the compressed trie with an example.
11. Explain the Brute-force algorithm with an example.

BR-20

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
II B.Tech - I Semester - I Mid Term Examination, November-2022
(R20CSE2101) DATA STRUCTURES

D4

Duration: 90 Mins

(For CSE, IT, AIML, AIDS, CS, CSIT, DS and IoT)

Dt: 28-11-2022, Day-1 (AN)

Section - A

Max Marks: 25M

Answer All the questions

* (I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating, and VI-Creating.)

Marks: 5Qx1M = 5M

1. Define Linear data structure.
2. Explain the advantages and disadvantages of linked list.
3. What is Hash Function?
4. List the collision resolution techniques?
5. What is an AVL Tree? Give one example?

Section - B

Answer any FOUR questions

6. Discuss about implementation of single linked list.
7. Explain about Stack applications and Queue applications.
8. What are the two methods of representing Liner list? Explain with example.
9. Explain: a) How does collision occur? and b) Explain: chaining and open addressing methods for detecting collision and overflow.
10. What is hashing? Explain the differentiation between hashing and skip list.
11. Write a program to perform following operations in Binary search tree:
 - a) Insert an element into a binary search tree.
 - b) Delete an element from a binary search tree.

Blooms Taxonomy Level	Course Outcomes
I	CO4
II	CO1
I	CO2
I	CO2
I	CO3

Ab: 210/3302

3326

Marks: 4Qx5M = 20M

Blooms Taxonomy Level	Course Outcomes
II	CO1
II	CO1
I	CO2
II	CO2

Blooms Taxonomy Level	Course Outcomes
II	CO2
VI	CO4

BR-20

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
II B.Tech - I Semester - II Mid Term Examination, Jan/Feb.-2023
(R20CSE2101) DATA STRUCTURES

D4

Duration: 90 Mins

(For CSE, IT, AIML, AIDS, CS, CSIT, DS and IoT)

Dt: 31-01-2023, Day-1 (AN)

Section - A

Max Marks: 25M

Answer All the questions

* (I-Remembering, II-Understanding, III-Applying, IV-Analyzing, V-Evaluating, and VI-Creating.)

Marks: 5Qx1M = 5M

1. List the rules of Red-Black Tree.
2. Define a graph.
3. Describe heap sort.
4. What are the different types of Pattern Matching Algorithms?
5. Write about Compressed Trie.

Section - B

Answer any FOUR questions

Marks: 4Qx5M = 20M

6. Write list of operations perform on AVL tree with example.
7. a) Develop a program to insert the elements into AVL tree?
b) Construction of AVL tree step by step with diagrams for the list {25, 30, 35, 40, 50, 55, 60, 65, 70, 75}.
8. Explain Depth first search traversal with example.
9. Discuss about merge sort technique with suitable example.
10. Write and explain Boyer Moore pattern matching algorithm.
11. Calculate the failure function (or) prefix table in a search string: "ABACAABADCABACABAABB".

Blooms Taxonomy Level	Course Outcomes
I	CO1
I	CO4
II	CO4
I	CO6
III	CO6

Blooms Taxonomy Level	Course Outcomes
III	CO4
VI	CO4
II	CO5
II	CO3
VI	CO6
VI	CO6



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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

II B.Tech. I Semester (REGULAR and SUPPL.) End Examinations, Feb - 2023.

(R20CSE2101) DATA STRUCTURES

15/02/2023 (For CSE, IT, AIML, AIDS, CS, CSIT, DS and IoT) Day- 2 (FN)

Duration: 3 Hrs

Maximum Marks: 70M

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

Course Outcomes : CO

SECTION-A

Answer ALL the following questions.

(5Qx 4M = 20M)

- | | |
|--|--------|
| 1. Differentiate linear and non-linear data structure. | II CO1 |
| 2. List out the advantages and disadvantages of rehashing. | I CO2 |
| 3. Explain the rotations of AVL trees with example. | II CO4 |
| 4. What is visiting and traversing in graph? | I CO5 |
| 5. Construct the standard trie for the following string, S= {ant, animal, blew, blue}. | V CO6 |

SECTION-B

Answer FIVE questions choosing at least one from each unit.

(5Qx10M = 50M)

UNIT-I

6. Write an algorithm for converting infix expression to post-fix expression. Trace the algorithm indicating content of stack for expression $(a-b)/(c*d)+e$. III CO1

OR

7. What are different types of linked list? Write a function to count number of elements present in single linked list. III CO1

UNIT-II

8. Define hashing. What are the properties of a good hash function? With necessary example explain four different hashing techniques. II CO2

OR

9. Define collision. What is linear probing? The following keys 10, 16, 11, 1, 3, 4, 23 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \text{ mod } 10$ and linear probing. What is the resultant hash table? III CO2

UNIT-III

10. List the properties of BST And Create a BST by inserting numbers 1 to 9. I CO3

OR

11. Explain how merging and splitting operations is done on a Splay Tree. VI CO3

COURSE OUTCOMES (CO's)

Academic Year: 2024-25

Class: II YEAR-I SEM.

Course Name: COMPUTER ORIENTED AND STATISTICAL METHODS (R22MTH2114)

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

Course Outcomes (COs)	
C211.1	Describe the probability of an event, product rule, addition rule & Baye's rule.(Understand)
C211.2	Explain Random variables and Chebyshev's theorem, Discrete probability distribution(Understand)
C211.3	Calculate the area under the normal curve and applications of the normal distribution(Apply)
C211.4	Analyze the fundamental sampling distributions.(Analyze)
C211.5	Test the Hypothesis of single mean, double mean, single proportion, double proportion.(Evaluate)
C211.6	Evaluate Transition Probability Matrix.(Evaluate)

Mapping of Course Outcomes(CO's) with PO's:

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C211.1	3	2	3	2	-	-	-	-	-	-	2	2
C211.2	3	3	3	2	-	-	-	-	-	-	2	2
C211.3	3	3	3	3	-	-	-	-	-	-	2	2
C211.4	3	3	3	2	-	-	-	-	-	-	2	2
C211.5	3	3	3	2	-	-	-	-	-	-	2	2
C211.6	3	2	2	2	-	-	-	-	-	-	2	2
C211	3	2.66	2.83	2.16	-	-	-	-	-	-	2	2

3: High 2. Medium 1. Low

Mapping of Course Outcomes(CO's) with PSO's:

COs	PSO1	PSO2	PSO3
C211.1	2	2	1
C211.2	2	2	1
C211.3	2	2	2
C211.4	3	3	3
C211.5	3	3	3
C211.6	2	2	1
	2.3	2.3	1.83

SYLLABUS

COMPUTER ORIENTED STATISTICAL METHODS

B.Tech. II Year I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- The theory of Probability, Probability distributions of single and multiple random variables
- The sampling theory, testing of hypothesis and making statistical inferences
- Stochastic process and Markov chains.

Course outcomes: After learning the contents of this paper the student must be able to

- Apply the concepts of probability and distributions to case studies.
- Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
- Apply concept of estimation and testing of hypothesis to case studies.
- Correlate the concepts of one unit to the concepts in other units.

UNIT - I: Probability

14 L

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule,

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

UNIT - II: Expectation and discrete distributions

12 L

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT - III: Continuous and Sampling Distributions

14 L

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F- Distribution.

UNIT - IV: Sample Estimation & Tests of Hypotheses

15 L

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

UNIT-V: Stochastic Processes and Markov Chains**9L**

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers.
- S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
2. S.D.Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

REFERENCE BOOKS:

1. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.
3. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.

	SRI INDU COLLEGE OF ENGG & TECH		(Regulation :BR22)
	DEPARTMENT OF INFORMATION TECHNOLOGY		
	Sub. Code & Title	(R22MTH2114) COMPUTER ORIENTED STATISTICAL METHODS	
	Academic Year: 2024-2025	Year/Sem/Section	II/I/IT
	Faculty Name & Designation	T SRINIVASULU, 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				
UNIT-I								
I	PROBABILITY					14		
1.1	Basics of probability - definitions	T1	22	23	Black board	1		CO1
1.2	Sample space, Events, Counting sample points, Probability of an event	T1	23	43	Black board	4		CO1
1.3	Additive Rules, Conditional Probability	T1	43	49	Black board	3		CO1
1.4	Independence and Product Rule, Baye's Rule	T1	50	60	Black board	4		CO1
1.5	Concept of Random Variable	T1	63	65	Black board	1		CO1
1.6	Discrete and continuous Probability Distributions	T1	65	69	Black board	1		CO1
	Review	Signature of the HOD/Coordinator						

Unit / Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT –II								
II	EXPECTATIONS AND DISCRETE DISTRIBUTIONS					12		
2.1	Mean of a Random variable	T1	88	9	Black board	1		CO2
2.2	Variance and Covariance of Random variables	T1	95	103	Black board	2		CO2
2.3	Mean and Variance of Linear Combination of Random variable	T1	103	111	Black board	2		CO2
2.4	Chebyshev's Theorem	T1	111	112	Black board	1		CO2
2.5	Discrete Probability Distributions: Introduction	T1	115	117	Black board	1		CO2
2.6	Binomial distribution	T1	117	122	Black board	2		CO2
2.7	Geometric Distribution	T1	132	135	Black board	1		CO2
2.8	Poisson distribution	T1	135	138	Black board	2		CO2
	Review	Signature of the HOD/Coordinator						

Unit / Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT - III								
III	CONTINUOUS AND SAMPLING DISTRIBUTIONS					14		
3.1	Continuous Uniform Distribution	T1	142	143	Black board	1		CO3
3.2	Normal Distribution, Area under the Normal curve	T1	143	152	Black board	2		CO3
3.3	Applications of Normal Distribution	T1	152	156	Black board	2		CO3
3.4	Normal Approximation to Binomial, Gamma and Exponential distributions	T1	158	167	Black board	1		CO3
3.5	Fundamental Sampling Distributions: Random Sampling, its statistics	T1	194	214	Black board	3		CO4
3.6	Sampling distribution of S^2	T1	216	219	Black board	2		CO4
3.7	t – Distribution	T1	219	225	Black board	2		CO4
3.8	F – Distribution	T1	225	226	Black board	1		CO4
	Review	Signature of the HOD/Coordinator						

Unit / Item No.		Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT- IV								
IV	SAMPLE ESTIMATION & TESTS OF HYPOTHESIS					15		
4.1	Introduction, classification of estimation	T1	230	234	Black board	1		CO5
4.2	Estimating the Mean	T1	234	240	Black board	1		CO5
4.3	Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits	T1	240	245	Black board	2		CO5
4.4	Estimating a Proportion for single mean, Difference of two means	T1	245	250	Black board	1		CO5
4.5	Maximum Likelihood Estimation	T1	275	280	Black board	1		CO5
4.6	Statistical Hypothesis: Introduction, Procedure of Testing a Statistical Hypothesis	T1	284	299	Black board	2		CO5
4.7	Test of Single mean	T1	300	306	Black board	1		CO5
4.8	Test of two means	T1	307	312	Black board	1		CO5
4.9	Test of Single Proportion	T1	323	326	Black board	2		CO5
4.10	Test of Two Proportions	T1	326	328	Black board	1		CO5
4.11	χ^2 - distribution	T1	329	332	Black board	2		
	Review	Signature of the HOD/Coordinator						
Unit / Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT - V								
V	STOCHASTIC PROCESSES AND MARKOV CHAINS					9		
5.1	Introduction to Stochastic Process – Markov Process	T2	163	164	Black board	1		CO6
5.2	Transition Probability, Transition Probability Matrix	T2	164	168	Black board	2		CO6
5.3	First and Higher Order Markov Process	T2	169	172	Black board	1		CO6
5.4	N – step transition probabilities	T2	172	173	PPT	1		CO6
5.5	Markov chain, Steady state condition	T2	193	195	Black board	2		CO6
5.6	Markov Analysis	T2	195	198	Black board	2		CO6
	Review	Signature of the HOD/Coordinator						

	SRI INDU COLLEGE OF ENGG & TECH		
	Department of Information Technology		Regulation: R22
	Sub. Code & Title	(R22MTH2114) COMPUTER ORIENTED & STATISTICAL METHODS	
	Academic Year: 2024-25	Year/Sem/Section	II/I/IT
	Faculty Name & Designation	T SRINIVASULU, Assistant Professor	

LIST OF TEXT BOOKS AND REFERENCES

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability and Statistics for Engineering and Scientists, 9th Edition, Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, Khanna publications.
3. S.D Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

REFERENCE BOOKS:

1. T.T.Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley and Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and Statistics for Engineers and Scientists, academic press.

CONTENT BEYOND THE SYLLABUS

S. No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Bernoulli's and exponential distributions	To get knowledge		T SRINIVASULU	PO1	PSO1, PSO2
2	Classification of samples	To get knowledge		M. GOVIND AMBICA	PO1	PSO1, PSO2

	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY Department of Humanities & Sciences QUESTION BANK		
	Subject Code / Title	R22MTH2114 COMPUTER ORIENTED STATISTICAL METHODS (Regulation: R22)	
	Academic Year: 2024-25	Year / Semester / Branches	II / I / IT
	Faculty Name & Designation	Dr. D. Venkatesan, Assistant Professor Dr. Aijaz Ahmad, Assistant Professor Dr. Aijaz Ahmad Magray, Assistant Professor Mr. T. Srinivasulu, Assistant Professor.	

QUESTIONBANK WITH BLOOMS TAXONOMYLEVEL (BT Levels)
 (I.Remembering, II.Understanding, III.Applying, IV.Analyzing, V.Evaluating, VI.Creating)

UNIT-I PROBABILITY			
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
1C1	What happens if repetitions are not allowed, the number of two-digit numbers can be formed from the numbers 2,3,5,6 are A) 10 B) 11 C) 12 D) 13	I	CO1
1C2	Assume there are 6 balls in a box. The number of ways that the two balls can be drawn with replacement is A) 6 B) 36 C) 63 D) 66	IV	CO1
1C3	The probability of getting a sum of 6 if two dice are thrown is A) $\frac{5}{36}$ B) $\frac{6}{36}$ C) $\frac{7}{36}$ D) $\frac{8}{36}$	III	CO1
1C4	If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{5}$, then $P(A \cup B) =$ A) $\frac{11}{20}$ B) $\frac{10}{20}$ C) $\frac{12}{20}$ D) $\frac{13}{20}$	I	CO1
1C5	The probabilities of two students to solve the problem independently are $\frac{1}{2}$ and $\frac{1}{3}$. The probability that the problem can be solved is A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{5}{6}$ D) $\frac{7}{8}$	III	CO1
1C6	Two dice are thrown. Illustrate the probability of getting at least one six is A) $\frac{1}{9}$	II	CO1

	<p>B) $\frac{2}{3}$ C) $\frac{3}{9}$ D) NONE</p>		
1C7	<p>In tossing three coins, what is the probability of getting at least one head is</p> <p>A) $\frac{5}{8}$ B) $\frac{6}{8}$ C) $\frac{7}{8}$ D) $\frac{4}{8}$</p>	I	CO1
1C8	<p>Predict $P(\emptyset) = \underline{\hspace{2cm}}$ Where $\emptyset =$ null set</p> <p>A) 1 B) 0 C) 2 D) NONE</p>	VI	CO1
1C9	<p>Three students A, B and C are in a swimming race. A and C have the same probability of winning and each is thrice as likely to win as B. Interpret the probability that B wins is</p> <p>A) $\frac{1}{7}$ B) $\frac{3}{7}$ C) $\frac{2}{7}$ D) None</p>	II	CO1
1C10	<p>A, B and C hit a target with probabilities $\frac{3}{5}, \frac{2}{5}, \frac{3}{4}$ respectively. If all of them fire at the target, then the probability that none of them hits the target is</p> <p>A) $\frac{94}{100}$ B) $\frac{6}{100}$ C) 1 D) None</p>	I	CO1
1C11	<p>For a continuous random variable X the function $f(X)$ satisfies which of the following</p> <p>A) $f(X) \geq 0$ B) $\int_{-\infty}^{\infty} f(X) dx = 0$ C) Both D) None</p>	I	CO1
1C12	<p>If A and B are any two events in sample space S, then $P(A \cap B) =$</p> <p>A) $P(A) \cdot P\left(\frac{B}{A}\right)$ if $P(A) \neq 0$ B) $P(B) \cdot P\left(\frac{A}{B}\right)$ if $P(B) \neq 0$ C) Both A and B D) NONE</p>	II	CO1
1C13	<p>Two events A and B are independent events if and only if $P(A \cap B) =$</p> <p>A) 0 B) $P(A)$ C) $P(B)$ D) $P(A) \cdot P(B)$</p>	III	CO1
1C14	<p>All possible events in any trial are known as _____</p> <p>A) Exhaustive events B) Mutually exclusive events C) Equally likely events D) Complementary events</p>	I	CO1
1C15	<p>Analyze the probability for a leap year to have 52 Mondays and 53 Sundays is</p> <p>A) $\frac{2}{7}$</p>	IV	CO1

	B) $\frac{1}{7}$ C) $\frac{3}{7}$ D) $\frac{4}{7}$		
--	--	--	--

FILL IN THE BLANKS

1F1	In a bag, there are 3 red balls and 2 blue balls. One ball is drawn. The probability of getting a red ball is _____	II	CO1
1F2	If $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A \cup B) = \frac{1}{3}$ then $P(B/A) =$ _____	IV	CO1
1F3	If a die is thrown three times, the sample space contains _____ elements.	I	CO1
1F4	If a die is thrown, the probability the face is 2,3 or 5 is _____	I	CO1
1F5	In a box, there are ten cards numbered 1 to 10. Two cards are drawn. Develop the probability that both are even is _____	III	CO1
1F6	How many different ways can 2 or 5 laboratory assistants be chosen to assist with an experiment? _____	I	CO1
1F7	What is the probability of drawing two aces from a well-shuffled deck of 52 playing cards _____	I	CO1
1F8	For two rolls of balanced die, the probability of getting first a 4 and then a number less than 4 is _____	II	CO1
1F9	Two events A and B are said to be independent if $P(B/A) =$ _____	VI	CO1
1F10	If repetition is not permitted, how many 2-digit numbers can be formed from the 5-digits 3,4,5,6, and 7.....	I	CO1
1F11	If $P(C) = 0.65$, $P(D) = 0.40$ and $P(C \cap D) = 0.24$ then the probability of C or D is _____	III	CO1
1F12	If $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{6}$, $P(A \cup B) = \frac{1}{4}$, then $P(B/A) =$ _____	V	CO1
1F13	$P(A/B) = \frac{1}{10}$, $P(B) = \frac{1}{5}$, then $P(A^c \cup B^c) =$ _____	I	CO1
1F14	If a test consists of 18 true-false questions, in how many different ways can a student mark the test paper with one answer to each question _____	II	CO1
1F15	If a random variable takes at most a countable number of values, it is called a _____ random variable	II	CO1

MATCH THE FOLLOWING

1M1	i) If a coin is tossed n times, the number of possible outcomes are	a) 36	II	CO1
	ii) If a die is thrown two times, the number of possible outcomes are	b) a sample space		
	iii) Event is a subset of	c) $1 - P(E)$		
	iv) $P(\bar{E})$	d) 2^n		
1M2	i) In how many ways can a student answer 3 questions which have 4 options each?	a) 840	III	CO1
	ii) If no repetitions are allowed then how many 5-digit numbers can be formed from digits 1,2,3,4,5,6,7?	b) $P(B) - P(A \cap B)$		
	iii) In how many ways 5 students can be selected out of 20 students	c) 64		
	iv) $P(\bar{A} \cap B) =$	d) $20C_5$		

1M3	i) A coin is tossed (m+n) times, the probability of at least m consecutive heads is	a) {H,T}	II	CO1
	ii) $P(S)$ is	b) $\frac{n+2}{2^{m+1}}$		
	iii) In tossing a coin sample space S =	c) $P(A) + P(B)$		
	iv) if events are mutually exclusive then $P(A \cap B)$	d) 1		
1M4	i) If A and B are any two events, then $P(A \cup B) =$	a) $\frac{5}{36}$	I	CO1
	ii) Find the probability of getting a head in a throw of a coin	b) $P(A) + P(B) - P(A \cap B)$		
	iii) The probability of getting a sum of 8 if two dice are thrown is	c) simple event		
	iv) an event in trial that cannot be further split is known as	d) $\frac{1}{2}$		
1M5	i) If three coins are tossed, find the probability of three tails	a) $1 - P(A \cap B)$	II	CO1
	ii) If A and B are any two events such that $P(A) = 0.5, P(B) = 0.3$ and $P(A \cap B) = 0.2$, then $P(A \cup B)$ is	b) $\frac{1}{8}$		
	iii) $P(E) =$	c) 0.6		
	iv) $P(\bar{A} \cup \bar{B})$	d) $\frac{m}{n}$		
DESCRIPTIVE QUESTIONS				
1D1	A bag contains 5 red balls, 8 blue balls and 11 white balls. Three balls are drawn together from the box. Find the probability that i) one is red, one is blue and one is white ii) two whites and one red iii) three whites	I	CO1	
1D2	A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the probability that i) 3 boys are selected ii) exactly 2 girls are selected	I	CO1	
1D3	If $P(A) = \frac{1}{5}, P(B) = \frac{2}{3}, P(A \cap B) = \frac{1}{15}$. Summarize a) $P(A \cup B)$ b) $P(\bar{A} \cap B)$ c) $P(A \cap \bar{B})$ d) $P(\bar{A} \cap \bar{B})$ e) $P(\bar{A} \cup \bar{B})$	II	CO1	
1D4	Among 150 students 80 are studying maths, 40 are studying physics and 30 are studying maths and physics. If a student is chosen at random, illustrate the probability that the student i) studying maths or physics ii) studying neither maths nor physics.	II	CO1	
1D5	If $P(A) = \frac{1}{3}, P(B) = \frac{1}{4}, P(A \cap B) = \frac{1}{5}$ solve a) $P(A B)$ b) $P(B A)$ c) $P(A \cup B)$ d) $P(\bar{B} \bar{A})$	III	CO1	
1D6	Three machines I, II and III produce 40%, 30% and 30% of the total number of items of the factory. The percentage of defective items of these machines are 4%, 2% and 3%. If an item is selected at random, find the probability that the item is defective	I	CO1	
1D7	Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same color	I	CO1	
1D8	State and prove Bayes rule.	V	CO1	
1D9	In a bolt factory machines A, B, C manufacturers 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Examine the probabilities that is manufactured from i) Machine A ii) Machine B iii) Machine C.	IV	CO1	
1D10	Of the three men, the chances that a politician, a business man or an academician will be appointed as a vice-chancellor (V.C) of a university are 0.5, 0.3, 0.2 respectively.	IV	CO1	

	Probability that research is promoted by these persons if they are appointed as V.C are 0.3,0.7,0.8 respectively Examine i) the probability that research is promoted ii) if research is promoted, what is the probability that V.C is an academician.		
1D11	In a factory, machine A produces 40% of the output and machine B produces 60%. on average 9 items in 1000 produced by A are defective and 1 item is 250 produced by B is defective. An item drawn at random from a day's output is defective. Illustrate probability that is produced by A or B?	II	CO1
1D12	A, B and C are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that of C is 2 out of 3. If the three aim the balloon simultaneously then Analyze the probability that at least two of them hit the balloon.	IV	CO1
1D13	Explain short notes on random variables.	V	CO1
1D14	Two marbles are drawn in succession from a box containing 10 red,30 white,20 blue and 15 orange marbles, with replacements being made after each draw. Find the probability that i) both are white ii) first is red and second is white	I	CO1
1D15	Three students A, B, C are in running race. A and B have the same probability of winning and each is twice as likely to win as C. Solve the probability that B or C wins?	III	CO1
UNIT-II MATHEMATICAL EXPECTATION AND DISCRETE PROBABILITY DISTRIBUTIONS			
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
2C1	If X is a random variable such that $E(X) = 3$ and $E(X^2) = 13$. Illustrate the probability theorem is _____ A) $\frac{25}{4}$ B) $\frac{4}{25}$ C) $\frac{21}{25}$ D) None	II	CO2
2C2	Outline $E(KX) =$ A) $K E(X)$ B) $K^2 E(X)$ C) $E(X)$ D) None	II	CO2
2C3	$Var(K + X) =$ A) $Var(K)$ B) $K + Var(X)$ C) $K^2 Var(X)$ D) None	I	CO2
2C4	Mean of P.d.f $f(x) = \frac{1}{4} e^{-\frac{x}{4}}$ for $x > 0$ else value is _____ A) 2 B) 1 C) 4 D) None	V	CO2
2C5	Identify Mean of the binomial distribution _____ A) np B) npq C) p^2q D) None	III	CO2
2C6	Variance of the binomial distribution is _____ A) np B) npq C) nq D) None	II	CO2
2C7	If the probability density of a random variable is given by $f(x) = \begin{cases} kx^3, & 0 < x < 1 \\ 0, & otherwise \end{cases}$ Then the value of k is A) 1 B) 2 C) 3 D) 4	VI	CO2
2C8	For the following density function $f(x) = 12x^2(1 - x), 0 < x < 1$ then mean is A) $\frac{2}{5}$	IV	CO2

	B) $\frac{2}{3}$ C) $\frac{3}{5}$ D) $\frac{1}{5}$		
2C9	The mean of the Poisson distribution is _____ A) λ B) λ^2 C) λ^3 D) None	V	CO2
2C10	The mode of the binomial distribution for which the means is 4 and variance 3 is A) 2 B) 4 C) 8 D) 3	III	CO2
2C11	The mean of the probability distribution of the number of heads obtained in two flips of a balanced coin is A) 1 B) 0 C) 2 D) 3	II	CO2
2C12	The distribution in which the mean is equal to the variance is _____ A) Binomial distribution B) Poisson distribution C) Normal distribution D) Uniform distribution	I	CO2
2C13	If mean = 5, variance = $\frac{10}{3}$ of a binomial distribution, then n = _____ A) 0 B) 3 C) 5 D) 7	III	CO2
2C14	If X is Poisson distribution such that $\mu = 2$, then $P(X = 1) =$ A) 0.9 B) 0.27 C) 0.36 D) 0.4	IV	CO2
2C15	The number of parameters in a Poisson distribution is _____ A) 1 B) 2 C) 3 D) 4	V	CO2
FILL IN THE BLANKS			
2F1	If k is constant then $\text{var}(k) =$ _____	II	CO2
2F2	If X is a random variable and $V(X) = 2$ then $V(2X + 3) =$ _____	II	CO2
2F3	If X is uniformly distributed in [a,b] then $E(X) =$ _____	I	CO2
2F4	The relation between the probability density function and cumulative density function of a random variable is _____	I	CO2
2F5	If X and Y are independent random variables, then $E(XY) =$ _____	IV	CO2
2F6	$f(x) = kx(1 - x)$ in $0 < x < 1$ is a valid probability density function if k = _____	I	CO2
2F7	The mean of the density function $f(x) = \lambda e^{-\lambda x}$ is _____	V	CO2
2F8	The maximum value of probability is _____	VI	CO2
2F9	Mean and variance in a Poisson distribution are _____	III	CO2
2F10	A coin is tossed 7 times. The mode of distribution of getting head is _____	I	CO2
2F11	In a binomial distribution, mean is 48 and the SD is 4 then p = _____	II	CO2

2F12	In a Poisson distribution $P(X = 0) = 0.2$ then $V(x) =$ _____	II	CO2
2F13	If an ace of spades is drawn from a pack of well-shuffled cards once in 104 trials, then the mean is _____	IV	CO2
2F14	The mean of the distribution of getting heads in tossing a coin 5 times is _____	IV	CO2
2F15	If x is Poisson variate such that $E(x^2) = 6$, then $E(x) =$ _____	II	CO2

MATCH THE FOLLOWING

2M1	I) If X is a random variable then $V(aX+b)$	A) $aE(x) + b$	II	CO2
	II) $V(a)$	B) $a^2V(x)$		
	III) $E(ax+b)$	C) 1		
	IV) $\sum_{i=1}^n P(x_i)$	D) 0		

2M2	I) $P(X = r)$	A) np	I	CO2
	II) $E(1)$	B) $nC_r(p^r)q^{n-r}$		
	III) Mean of binomial distribution	C) npq		
	IV) Variance of binomial distribution	D) 1		

2M3	i) mean	a) $\sum_{i=1}^n x_i^2 P(x_i) - \mu^2$	II	CO2
	ii) variance	b) 1		
	iii) total probability	c) $\sum_{i=1}^n x_i P(x_i)$		

2M4	i) $E(X)$	a) $f(x) = \frac{d}{dx} F(x)$	I	CO2
	ii) Total probability	b) $\int_{-\infty}^{\infty} x_i^2 f(x) - \mu^2$		
	iii) $E(X^2) - [E(X)]^2$	c) $\int_{-\infty}^{\infty} x_i f(x)$		
	iv) Density function	d) $\int_a^b f(x) dx = 1$		

2M5	i) $P(X < x)$	a) $1 - P(X > x)$	III	CO2
	ii) $P(X > x)$	b) $1 - P(X < x)$		
	iii) $P(X \leq x)$	c) $1 - P(X \geq x)$		
	iv) $P(X \geq x)$	d) $1 - P(X \leq x)$		

DESCRIPTIVE QUESTIONS

2D1	A random variable X has the following probability distribution								V	CO2	
	X	1	2	3	4	5	6	7			8
	P(X)	K	2K	3K	4K	5K	6K	7K			8K
Find the value of a) K b) $P(X \leq 2)$ c) $P(2 \leq X \leq 5)$											

2D2	Let X denote the minimum of the two numbers that appear when a pair of each fair dice is thrown once. Determine a) discrete probability function b) expectation and c) variance	III	CO2													
2D3	A random variable X has the following probability function Find i) K ii) Mean iii) variance	I	CO2													
	<table border="1"> <tbody> <tr> <td>X</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>P(X)</td> <td>K</td> <td>0.1</td> <td>K</td> <td>0.2</td> <td>2K</td> <td>0.4</td> <td>2K</td> </tr> </tbody> </table>			X	-3	-2	-1	0	1	2	3	P(X)	K	0.1	K	0.2
X	-3	-2	-1	0	1	2	3									
P(X)	K	0.1	K	0.2	2K	0.4	2K									
2D4	For the following probability distribution Find i) E(X) ii) E(X ²)	II	CO2													
<table border="1"> <tbody> <tr> <td>x</td> <td>-3</td> <td>6</td> <td>9</td> </tr> <tr> <td>P(x)</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{2}$</td> <td>$\frac{1}{3}$</td> </tr> </tbody> </table>	x			-3	6	9	P(x)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$						
x	-3	6	9													
P(x)	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$													
2D5	If the probability density of a random variable is given by $f(x) = \begin{cases} k(1-x^2), & \text{for } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ Find the value of K and the probabilities that a random variable having this probability density will take on a value i) between 0.1 and 0.2 ii) greater than 0.5.	I	CO2													
2D6	A continuous random variable X has the distribution function $f(x) = \begin{cases} 0, & \text{if } x \leq 1 \\ k(x-1)^4, & \text{if } 1 < x \leq 3 \\ 1, & \text{if } x > 3 \end{cases}$ determine i) f(x) ii) K iii) mean	VI	CO2													
2D7	A fair die is tossed. Let the random variable X denotes twice the number appearing on the die, Write the distribution of X, Find the (i) mean (ii) variance (iii) standard deviation	I	CO2													
2D8	Derive variance of binomial distribution.	IV	CO2													
2D9	Out of 800 families with 5 children each, how many would you expect to have a) 3 boys b) 5 girls c) either 2 or 3 boys d) at least one boy? Assume equal probabilities for boys and girls.	I	CO2													
2D10	20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at a random i) none is defective ii) one is defective iii) $P(1 < x < 4)$	I	CO2													
2D11	Derive mean of Poisson distribution	III	CO2													
2D12	Given that $P(X=2) = 9P(X=4) + 90P(X=46)$ for a Poisson variate X. find i) $P(X < 2)$ ii) $P(X > 4)$ iii) $P(X \geq 1)$	II	CO2													
2D13	Average number of accidents on any day on a national highway is 1.8. Illustrate the probability that the number of accidents are i) at least one ii) at most one.	II	CO2													
2D14	Fit a Poisson distribution to the following data	II	CO2													
	<table border="1"> <tbody> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>y</td> <td>42</td> <td>33</td> <td>14</td> <td>6</td> <td>4</td> <td>1</td> </tr> </tbody> </table>			x	0	1	2	3	4	5	y	42	33	14	6	4
x	0	1	2	3	4	5										
y	42	33	14	6	4	1										

2D15	Fit a binomial distribution to the following data					II	CO2	
	X	0	1	2	3			4
	F	38	144	342	287			164

UNIT-III CONTINUOUS AND SAMPLING DISTRIBUTIONS

S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
3C1	What is the Total area under the standard normal curve a) 0 b) 1 c) 2 d) ∞	I	CO3
3C2	If X is standard variate, then $P(0 \leq Z \leq 1.2) =$ _____ a) 0.3849 b) 0.21 c) 0.48 d) 0.57	II	CO3
3C3	If X is a normal variate, then the mean deviation from the mean is a) $\frac{1}{2}\sigma$ b) σ c) $\frac{3}{4}\sigma$ d) $\frac{4}{5}\sigma$	I	CO3
3C4	The mode of normal distribution is _____ a) μ b) $\frac{\mu}{2}$ c) $x - \mu$ d) $\mu\sigma$	II	CO3
3C5	The distribution in which mean, median and mode coincide is _____ a) Binomial b) Poisson c) Normal d) Uniform	IV	CO3
3C6	The area under the normal curve between $z = 0$ and $z = 1.5$ is 0.4332, then the area which to the left of -1.5 is a) 0.001 b) 0.0668 c) 0.0778 d) 0.0787	III	CO3
3C7	The area under the normal distribution curve between $z = 0$ and $z = \infty$ is a) 1 b) 0.5 c) 1.5 d) 2	III	CO3
3C8	If the mean of a normal distribution is 12, then its mode is a) 6 b) 4 c) 8 d) None	II	CO3

3C9	The probability of including a specified unit or item in a sample of size n selected out of N units is _____ a) $\frac{1}{N}$ b) N^n c) NC_n d) <i>None</i>	VI	CO4
3C10	The standard error of the statistic sample mean (\bar{X}) is a) $\frac{\sigma}{\sqrt{n}}$ b) $\frac{\sigma^2}{\sqrt{n}}$ c) $\sqrt{\frac{\sigma}{n}}$ d) <i>None</i>	II	CO4
3C11	The statistical constants of the population are called _____ a) <i>Statistic</i> b) <i>Parameter</i> c) <i>Sample statistic</i> d) <i>None</i>	I	CO4
3C12	What is the number of possible samples of size n from a population of N units with replacement? a) N^n b) NC_n c) $\frac{1}{NC_n}$ d) <i>none</i>	I	CO4
3C13	Choose The finite population correction factor is _____ a) $\frac{N-n}{N-1}$ b) $\sqrt{\frac{N-n}{N-1}}$ c) $\frac{N-1}{N-n}$ d) $\sqrt{\frac{N-1}{N-n}}$	VI	CO4
3C14	If $x_1, x_2, x_3, \dots, x_n$ constitute a random sample from an infinite population with mean μ and variance σ^2 then interpret $\mu_{\bar{x}} =$ _____ and $\sigma_{\bar{x}}^2 =$ _____ a) $\mu, \frac{\sigma^2}{n}$ b) μ, σ^2 c) $\mu, \frac{N-n}{N-1}$ d) <i>None</i>	V	CO4
3C15	Define population consisting of all real numbers is an example of _____ a) <i>An infinite population</i> b) <i>An infinite population</i> c) <i>sample</i> d) <i>none</i>	I	CO4
FILL IN THE BLANKS			
3F1	If $\mu = 5$ and $\sigma = 2$, the equation of the normal distribution is _____	I	CO3
3F2	The area under the normal curve represents the _____	I	CO3
3F3	Asymptote to the curve of normal distribution is _____	I	CO3

3F4	If $z_1 < 0$ and $z_2 > 0$ then $P(x_1 \leq X \leq x_2) =$ _____	II	CO3
3F5	Write the mean, median, mode of a normal distribution _____	II	CO3
3F6	In the standard normal curve, the area between $Z = -1$ & $Z = 1$ is nearly _____	III	CO3
3F7	Determine Area under the whole normal curve is _____	V	CO3
3F8	The graph of the normal distribution is symmetric with respect to the line _____	VI	CO3
3F9	The probability distribution of a statistic is called _____	I	CO4
3F10	If $\bar{X} = 157$, $\mu = 155$, $\sigma = 15$ and $n = 36$ then Z is _____	III	CO4
3F11	The finite population correction factor is _____	IV	CO4
3F12	The standard error of the statistic sample mean (\bar{X}) is _____	I	CO4
3F13	Solve $P(Z > 1.76) =$ _____	III	CO4
3F14	If the size of the sample is 5 and the size of the population is 2000, Then the correction factor is _____	I	CO4
3F15	A coin is tossed 3 times, the probability of obtaining two heads will be _____	VI	CO4

MATCH THE FOLLOWING

3M1	1) $f(x; \mu, \sigma)$	a) $\frac{x-\mu}{\sigma}$	II	CO3
	2) Z	b) $\frac{(b-a)^2}{12}$		
	3) Uniform distribution of mean	c) $\frac{1}{\sigma\sqrt{2\pi}} e^{-\left[\frac{(x-\mu)^2}{2\sigma^2}\right]}$		
	4) Uniform distribution of variance	d) $\frac{a+b}{2}$		
3M2	1) Mean of normal distribution	a) Standard normal distribution	I	CO3
	2) Median of normal distribution	b) Λ		
	3) The normal distribution with mean $\mu = 0$ and standard deviation $\sigma = 1$	c) $\mu = b$		
	4) Mean of the exponential distribution	d) $\mu = M$		
3M3	A) Any statistical measure computed from population data is	i) statistic	II	CO4
	B) Any statistical measure computed from sample data	ii) size of the population		
	C) A random variable that is calculated from the sample	iii) parameter		
	D) The number of observations in the population	iv) population distribution		

3M4	A) The difference between a statistic and the parameter is a	i) population	I	CO4
	B) The sample is regarded as a subset of	ii) 0.9		
	C) The difference between the expected value of a statistic & the value of the parameter being estimated is called as	iii) Bias		
	D) The finite population correction factor for $n = 1000$ and $N = 10000$ is	iv) sampling error		
3M5	Find F - distribution for		I	CO4
	A) F_0 with $V_1 = 19$ and $V_2 = 24$	i) 0.135		
	B) $F_{0.95}$ with $V_1 = 12$ and $V_2 = 15$	ii) 0.473933		
	C) $F_{0.99}$ with $V_1 = 6$ and $V_2 = 20$	iii) 0.3717		
DESCRIPTIVE QUESTIONS				
3D1	Give the Applications of normal distribution.		III	CO3
3D2	In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.		V	CO3
3D3	The marks obtained in mathematics by 1000 students are normally distributed with mean 78% and standard deviation 11%. Determine (i) How many students got marks above 90%? (ii) What is the highest mark obtained by the lowest 10 % of the students? Within what limits did the middle of 90 % of the students lie.		V	CO3
3D4	In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5, Assuming the distribution to be normal, find a) How many students score between 12 and 15? b) How many score above 18 c) How many score below 18		I	CO3
3D5	If X is a normal variate, find the area A I. to the left of $z = -1.78$ II. to the right of $z = -1.45$ III. Corresponding to $-0.8 \leq z \leq 1.53$ IV. to the left of $z = -2.52$ and to the right of $z = 1.83$		I	CO3
3D6	The marks obtained in mathematics by 1000 students is normally distributed with a mean 78% and a standard deviation 11%. Determine a) How many students got marks above 90%? b) What was the highest mark obtained by the lowest 10% of the students? c) Within what limits did the middle of 90% of the students lie		IV	CO3
3D7	In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution.		I	CO3
3D8	A random sample of size 100 is taken from an infinite population having the mean $\mu = 76$ and variance 256. What is the probability that x will be between 75 and 78.		I	CO4
3D9	A population consists of six numbers 4,8,12,16,20,24. Consider all samples of size two which can be drawn without replacement from this population. Illustrate a. The population mean. b. The population standard deviation. c. The mean of the sampling distribution of means.		II	CO4

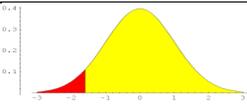
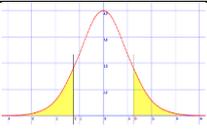
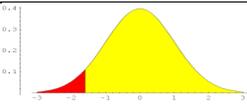
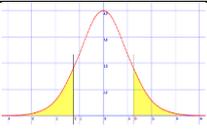
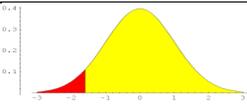
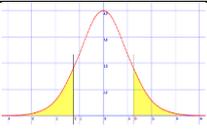
	d. The standard deviation of the sampling distribution of means.		
3D10	Explain briefly chi- square distribution.	IV	CO4
3D11	A random variance of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviations from the mean equals to 150. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% confidence limits of the mean of the population?	I	CO4
3D12	A population consists of 5, 10, 14, 18, 13, 24. consider all possible samples of size two which can be drawn without replacement from the population. Find a) The mean of the population b) The standard deviation of the population. C) The mean of the sampling distribution of means and d) The standard deviation of the sampling distribution of means	II	CO4
3D13	A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative?	II	CO4
3D14	A random sample of size 64 is taken from an infinite population having the mean $\mu = 51.4$ and standard deviation $\sigma = 68$. What is the probability that the mean of the sample will a) exceed 52.9 b) fall between 50.5 and 52.3 c) less than 50.6.	I	CO4
3D15	In a random sample of 100 packages shipped by air freight 13 had some damage. Determine the standard error of proportions.	VI	CO4
UNIT-IV: SAMPLE ESTIMATION & TESTS OF HYPOTHESES			
S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
4C1	The method to determine an unknown population parameter is known as a) Estimator b) Estimate c) Hypothesis testing d) Estimation	I	CO5
4C2	The Maximum error of estimate E with $(1 - \alpha)$ probability is a) $z_{\alpha} \left(\frac{\alpha}{2}\right)$ b) $z_{\alpha/2} \left(\frac{\alpha}{2}\right)$ c) $z_{\alpha} \left(\frac{-\alpha}{2}\right)$ d) $z_{\alpha} \left(\frac{\alpha^2}{2}\right)$	VI	CO5
4C3	Choose the Types of estimation to determine the statistics of the population parameters a) Biased and unbiased estimation b) Variance and point estimation c) Point and interval estimation d) Mean and interval estimation	V	CO5
4C4	A hypothesis is true but is rejected this is an error of type a) I b) II c) I and II d) None	I	CO5
4C5	In a city 250 men out of 750 men were found to be smoker the test statistic evaluate $ z =$ _____ a) 2.25 b) 2.5	V	CO5

	c) 5.25 d) 5.50		
4C6	$t_{1-\alpha} =$ _____ a) t_α b) $-t_\alpha$ c) $t_{\alpha-1}$ d) None	VI	CO5
4C7	The shape of t-distribution is similar to that of _____ a) chi-square distribution b) F-distribution c) Normal distribution d) None	III	CO5
4C8	Which distribution is used to test the equality of population means _____ a) chi-square distribution b) F-distribution c) t-distribution d) none	I	CO5
4C9	If $n=100$, $\sigma=5$ then illustrate the maximum error with 95% confidence is _____ a) 0.98 b) 1.2875 c) 3.92 d) 1.16	II	CO5
4C10	A sample of size n is taken from a pop whose variance is 9. Find The maximum error of estimate for μ with 95% confidence is 0.5 then $n=$ _____ a) 12 b) 68 c) 128 d) 139	I	CO5
4C11	The size of the large sample is _____ a) Exact b) Less than 30 c) Greater than 30 d) Equal to 30	I	CO5
4C12	The t-distribution is used to test the significance of the difference between _____ a) Mean of two small samples b) Variance of two small samples c) Mean of two large samples d) Variance of two large samples	II	CO5
4C13	The size of large sample is _____ a) $n > 30$ b) $n > 100$ c) $n < 60$ d) $n < 30$	VI	CO5
4C14	The value of test statistic F is _____ a) $F > 1$ b) $F < 1$ c) $F = 1$ d) $F = 0$	II	CO5
4C15	The number of degrees of freedom of chi-square test is _____ a) $n - 2$ b) $n - 3$ c) $n - 4$ d) $n - 1$	I	CO5
FILL IN THE BLANKS QUESTIONS			

4F1	If $n=144, \sigma=4$ and $x=150$ then examine 95% confidence interval for mean is _____	IV	CO5
4F2	A random sample of size 169 was taken from a population whose variance is 25 and mean is 50. Then interpret 99% confidence interval is _____	II	CO5
4F3	If we can assert with 95% that the maximum error is 0.5 and $p=0.2$ then illustrate the sample size is _____	II	CO5
4F4	A random sample of 400 products contain 52 defective items standard error of proportion is _____	I	CO5
4F5	Define the Range of t-distribution is _____	I	CO5
4F6	Inspect the Chi-square distribution is _____	IV	CO5
4F7	If the standard derivation of a chi-square distribution is 10, then illustrate its degrees of freedom is _____	II	CO5
4F8	A hypothesis is false but accepted this is an error of the type _____	I	CO5
4F9	What is the main use of F-test is _____	I	CO5
4F10	Develop A random variable X has the same distribution with _____ degree of freedom	VI	CO5
4F11	If two independent random sample of size $n_1=13$ and $n_2=7$ are taken from a normal population the variance of the first sample will be at least 4 times as that of a second sample then F is _____	II	CO5
4F12	A random sample of 400 products contain 52 defective items standard error of proportion is _____	II	CO5
4F13	If $\bar{X} = 47.5, \mu = 42.1, S = 8.4$ and $n=25$ then illustrate $t =$ _____	III	CO5
4F14	Two types of hypothesis are _____ and _____	I	CO5
4F15	A single-tailed test is used when _____	IV	CO5

MATCH THE FOLLOWING QUESTIONS

4M1	A) when null hypothesis is accepted, result is said to be	i) Type II	I	CO5
	B) The level of significance of a test denoted by α is the probability of commuting error	ii) reduced		
	C) when the size of the sample space is increased, the probability of commuting both types of errors can be _____ simultaneously	iii) Non – significant		
	D) when null hypothesis is rejected, result is said to be	iv) Type I		
4M2	A) The Chi-square distribution curve varies from	i) $(-\infty \text{ to } \infty)$	II	CO5
	B) range of F-distribution	ii) $(0 \text{ to } \infty)$		
	C) range of t- distribution	iii) $(0, \infty)$		

4M3	<p>Rejection rule for $H_0: P_1 = P_2$</p> <table border="1" data-bbox="268 197 1145 398"> <tbody> <tr> <td data-bbox="268 197 810 255">A) If $Z > 1.96$, then reject H_0 at</td> <td data-bbox="810 197 1145 255">i) 10% level of significance</td> </tr> <tr> <td data-bbox="268 255 810 313">B) If $Z > 2.58$, then reject H_0 at</td> <td data-bbox="810 255 1145 313">ii) 1% level of significance</td> </tr> <tr> <td data-bbox="268 313 810 398">C)) If $Z > 1.645$, then reject H_0 at</td> <td data-bbox="810 313 1145 398">iii) 5% level of significance</td> </tr> </tbody> </table>	A) If $ Z > 1.96$, then reject H_0 at	i) 10% level of significance	B) If $ Z > 2.58$, then reject H_0 at	ii) 1% level of significance	C)) If $ Z > 1.645$, then reject H_0 at	iii) 5% level of significance	V	CO5
A) If $ Z > 1.96$, then reject H_0 at	i) 10% level of significance								
B) If $ Z > 2.58$, then reject H_0 at	ii) 1% level of significance								
C)) If $ Z > 1.645$, then reject H_0 at	iii) 5% level of significance								
4M4	<table border="1" data-bbox="276 517 1142 815"> <tbody> <tr> <td data-bbox="276 517 914 622">A) Critical values for two –tailed test when level of significance is 5%</td> <td data-bbox="914 517 1142 622">i) $Z_{\alpha} = -2.33$</td> </tr> <tr> <td data-bbox="276 622 914 712">B) Critical values for right –tailed test when level of significance is 10%</td> <td data-bbox="914 622 1142 712">ii) $Z_{\alpha} = 1.96$</td> </tr> <tr> <td data-bbox="276 712 914 815">C) Critical values for left–tailed test when level of significance is 1%</td> <td data-bbox="914 712 1142 815">iii) $Z_{\alpha} = -1.28$</td> </tr> </tbody> </table>	A) Critical values for two –tailed test when level of significance is 5%	i) $Z_{\alpha} = -2.33$	B) Critical values for right –tailed test when level of significance is 10%	ii) $ Z_{\alpha} = 1.96$	C) Critical values for left–tailed test when level of significance is 1%	iii) $Z_{\alpha} = -1.28$	I	CO5
A) Critical values for two –tailed test when level of significance is 5%	i) $Z_{\alpha} = -2.33$								
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4M5	<table border="1" data-bbox="260 931 1150 1368"> <tbody> <tr> <td data-bbox="260 931 730 1066">i) Right sided tail</td> <td data-bbox="730 931 1150 1066">  <p>a)</p> </td> </tr> <tr> <td data-bbox="260 1066 730 1211">ii) Two-sided tail</td> <td data-bbox="730 1066 1150 1211">  <p>b)</p> </td> </tr> <tr> <td data-bbox="260 1211 730 1368">iii) Left sided tail</td> <td data-bbox="730 1211 1150 1368">  <p>c)</p> </td> </tr> </tbody> </table>	i) Right sided tail	 <p>a)</p>	ii) Two-sided tail	 <p>b)</p>	iii) Left sided tail	 <p>c)</p>	II	CO5
i) Right sided tail	 <p>a)</p>								
ii) Two-sided tail	 <p>b)</p>								
iii) Left sided tail	 <p>c)</p>								
DESCRIPTIVE QUESTIONS									
4D1	What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence.	I	CO5						
4D2	What is the maximum error one can expect to make with probability 0.90 when using the mean of a random sample of size $n = 64$ to estimate the mean of population with $\sigma^2 = 2.56$.	I	CO5						
4D3	Find 95% confidence limits for the mean of a normally distributed population from which the following sample was taken 15,17,10,18,16,9,7,11,13,14.	I	CO5						
4D4	Explain the procedure of testing of hypothesis.	II	CO5						
4D5	A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with a mean 38. Also, calculate 95% confidence interval for the population	VI	CO5						

4D6	<p>The samples of students were drawn from two universities and from their weights in kilograms, means and standard deviations are calculated below. Make a large sample test to test the significance of the difference between the means.</p> <table border="1" data-bbox="336 280 1074 405"> <thead> <tr> <th></th> <th>Size of sample</th> <th>Means</th> <th>S. D's</th> </tr> </thead> <tbody> <tr> <td>University A</td> <td>400</td> <td>55</td> <td>10</td> </tr> <tr> <td>University B</td> <td>100</td> <td>57</td> <td>15</td> </tr> </tbody> </table>		Size of sample	Means	S. D's	University A	400	55	10	University B	100	57	15	III	CO5										
	Size of sample	Means	S. D's																						
University A	400	55	10																						
University B	100	57	15																						
4D7	<p>The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D of 398 hours. Is there a significant difference between the means of two batches?</p>	IV	CO5																						
4D8	<p>In a sample of 1000 people on Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?</p>	IV	CO5																						
4D9	<p>In a city A, 20% of a random sample of 900 schoolboys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys has the same defect. Is the difference between the proportions significant at 0.05 level of significance?</p>	II	CO5																						
4D10	<p>A random sample of 10 boys had the following I. Q'S:70,120,110,101,88,83,95,98,107,100.</p> <p>a) Do these data support the assumption of a population mean IQ of 100?</p> <p>b) Find a reasonable range in which most of the mean I.Q values of samples of 10 boys lie?</p>	I	CO5																						
4D10	<p>Two independent samples of 8 and 7 items respectively had the following values.</p> <table border="1" data-bbox="277 1205 1165 1308"> <tbody> <tr> <td>SAMPLE-1</td> <td>11</td> <td>11</td> <td>13</td> <td>11</td> <td>15</td> <td>9</td> <td>12</td> <td>14</td> </tr> <tr> <td>SAMPLE-2</td> <td>9</td> <td>11</td> <td>10</td> <td>13</td> <td>9</td> <td>8</td> <td>10</td> <td>—</td> </tr> </tbody> </table> <p>Is the difference between the means of sample significant</p>	SAMPLE-1	11	11	13	11	15	9	12	14	SAMPLE-2	9	11	10	13	9	8	10	—	II	CO5				
SAMPLE-1	11	11	13	11	15	9	12	14																	
SAMPLE-2	9	11	10	13	9	8	10	—																	
4D11	<p>Memory capacity of 10 students was tested before and after training. Test whether the training was effective or not from the following scores.</p> <table border="1" data-bbox="304 1485 1179 1583"> <tbody> <tr> <td>Before</td> <td>12</td> <td>14</td> <td>11</td> <td>8</td> <td>7</td> <td>10</td> <td>3</td> <td>0</td> <td>5</td> <td>6</td> </tr> <tr> <td>After</td> <td>15</td> <td>16</td> <td>10</td> <td>7</td> <td>5</td> <td>12</td> <td>10</td> <td>2</td> <td>3</td> <td>8</td> </tr> </tbody> </table>	Before	12	14	11	8	7	10	3	0	5	6	After	15	16	10	7	5	12	10	2	3	8	VI	CO5
Before	12	14	11	8	7	10	3	0	5	6															
After	15	16	10	7	5	12	10	2	3	8															
4D12	<p>In one sample of 10 observations, the sum of the squares of deviations of the sample values from the sample mean was 120 and in the other sample of 12 observations it was 314. Test whether the difference is significant at 5% level?</p>	IV	CO5																						
4D13	<p>A die is thrown 264 times with the following results. Show that the die is biased. $\chi^2_{0.05}=11.07$ for 5 degrees of freedom</p> <table border="1" data-bbox="252 1892 1161 2018"> <tbody> <tr> <td>No. Appeared on the die</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>Frequency</td> <td>40</td> <td>32</td> <td>28</td> <td>58</td> <td>54</td> <td>52</td> </tr> </tbody> </table>	No. Appeared on the die	1	2	3	4	5	6	Frequency	40	32	28	58	54	52	I	CO5								
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4D14	<p>In an investigation on the machine performance, the following results are obtained</p> <table border="1" data-bbox="373 2123 1067 2186"> <tbody> <tr> <td></td> <td>No.of units inspected</td> <td>No. of defectives</td> </tr> </tbody> </table>		No.of units inspected	No. of defectives	IV	CO5																			
	No.of units inspected	No. of defectives																							

		Machine 1	375	17		
		Machine 2	450	22		

Test whether there is any significant performance of two machines at $\alpha = 0.05$

4D15	Method-I	20	16	26	27	23	22	—
	Method-II	27	33	42	35	32	34	38

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly?

UNIT V : STOCHASTIC PROCESSES AND MARKOV CHAINS

S. NO	MULTIPLE CHOICE QUESTIONS	BT LEVELS	COURSE OUTCOMES
5C1	A discrete parameter Markov process is called a _____ a) Markov process b) Stationary process c) Random process d) Markov chain	I	CO6
5C2	A square matrix in which the sum of all the elements of each row is called a _____ a) Unitary matrix b) Diagonal matrix c) Stochastic matrix d) Skew matrix	I	CO6
5C3	A stochastic matrix P is said to be regular if all the entries of P^m are _____ a) Negative b) Positive c) Semi positive d) Either positive or negative	III	CO6
5C4	If $\pi = (\pi_1, \pi_2, \pi_3, \dots, \pi_n)$ is the steady state distribution of the chain whose TPM is the n^{th} order square matrix P, then _____ a) $\pi P = \pi$ b) $\pi \mu = \pi$ c) $\pi A = n$ d) $\pi p = p$	V	CO6
5C5	The conditional probability $P \left[X_n = \frac{a_j}{x_{n-1}} = a_i \right]$ is called _____ a) Second tpm b) One-step tpm c) Homogenous tpm d) n-step tpm	II	CO6
5C6	If P is the tpm of a homogenous Markov chain, then the n-step tpm $p^{(n)} = p^n$ is known as _____ a) probability theorem b) Chapman-Kolmogorov theorem c) Markov theorem d) Chapman theorem	III	CO6
5C7	State i of a Markov chain is said to be _____ with period d_i if $d_i=1$ a) Periodic b) Not periodic c) A periodic d) Bi periodic	I	CO6

5C8	Every state can be reached from every other state; the Markov chain is said to be _____ a) Homogenous b) Reducible c) Irreducible d) Recurrent	IV	CO6
5C9	If $\pi p = \pi$ where $p = \begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ then value of $(\pi_1: \pi_2)$ is _____ a) $(\frac{1}{3}, \frac{2}{3})$ b) $(\frac{1}{2}, \frac{1}{2})$ c) $(\frac{2}{3}, \frac{1}{3})$ d) (0,1)	II	CO6
5C10	A Markov chain is completely specified when _____ a) Initial probability distribution b) TPM c) Absorbing state d) Both (a) and (b)	VI	CO6
5C11	Which of the following matrices are stochastic? a) $\begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ b) $\begin{bmatrix} 1 & 0 \\ -1 & \frac{1}{2} \end{bmatrix}$ c) $\begin{bmatrix} 1 & -1 \\ -1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 \\ -1 & -1 \end{bmatrix}$	I	CO6
5C12	Sum of each row should be equal to _____ a) 0 b) 2 c) 1 d) 2	IV	CO6
5C13	If all future value can be predicted from past observations is known as _____ a) Non deterministic stochastic process b) Stationary stochastic process c) Deterministic stochastic process d) Non- Stationary stochastic process	I	CO6
5C14	Stochastic process depends on _____ a) Both sample and time b) Sample c) Time d) Either sample or time	I	CO6
5C15	The set T is called _____ a) Mean value b) Stationary value c) Random variables d) Time domain	II	CO6
FILL IN THE BLANKS QUESTIONS			
5F1	A non-null persistent and a periodic state is called _____	IV	CO6
5F2	A state A is said to be _____ if the return to state i is certain.	V	CO6
5F3	If a Markov chain is finite irreducible, all its states are _____	III	CO6

5F4	If the one-step tpm does not depend on the step i.e. $P_{ij}(n-1,n)=P_{ij}(m-1,m)$ the Markov chain is called _____	I	CO6
5F5	State i of a Markov chain is said to be _____ with period $d_i > 1$.	II	CO6
5F6	A state i is said to be _____ if the return to state i is uncertain.	I	CO6
5F7	A state i is said to be _____ if the mean recurrence time μ_{ii} is finite.	I	CO6
5F8	A _____ is completely specified when initial probability distribution and tpm are given.	II	CO6
5F9	A state i is said to be _____ if the mean recurrence time $\mu_{ii} = \infty$	I	CO6
5F10	If the tpm of a Markov chain is $P = \begin{bmatrix} 0.1 & 0.5 & 0.4 \\ 0.6 & 0.2 & 0.2 \\ 0 & 0.4 & 0.3 \end{bmatrix}$. Find $P[X_1=3/X_0=2]$ is _____	IV	CO6
5F11	If X is the continuous and t is the discrete, the stochastic process is called as _____	I	CO6
5F12	A process which is not stationary is said to be _____	VI	CO6
5F13	A _____ is a square matrix with non-negative elements and unit row sums	V	CO6
5F14	A state i is said to be an _____ if and only if $P_{ii}=1$	III	CO6
5F15	The probability of changing from one transition to the rest transition is called _____	I	CO6

MATCH THE FOLLOWING QUESTIONS

5M1	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">A) A positive recurrent and a periodic state is called</td> <td style="width: 50%;">i) stochastic matrix</td> </tr> <tr> <td>B) If a tpm, if all entries of p^m are non-zero positive values then p is said to be a</td> <td>ii) ergodic</td> </tr> <tr> <td>C) In a tpm, if the elements of each of the rows are non-negative and sum of the elements is equal to 1. Then p is said to be</td> <td>iii) regular matrix</td> </tr> </table>	A) A positive recurrent and a periodic state is called	i) stochastic matrix	B) If a tpm, if all entries of p^m are non-zero positive values then p is said to be a	ii) ergodic	C) In a tpm, if the elements of each of the rows are non-negative and sum of the elements is equal to 1. Then p is said to be	iii) regular matrix	II	CO6
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5M2	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">A) which matrix is a stochastic matrix</td> <td style="width: 50%;">i) $\begin{bmatrix} 1 & 2 & 4 \\ 3 & 3 & 3 \\ 1 & 1 & 1 \\ 2 & 1 & 2 \end{bmatrix}$</td> </tr> <tr> <td>B) which matrix is a regular matrix</td> <td>ii) $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 1 \\ 2 & 4 & 4 \\ 0 & 1 & 0 \end{bmatrix}$</td> </tr> <tr> <td>C) which matrix is not a stochastic matrix</td> <td>iii) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}$</td> </tr> </table>	A) which matrix is a stochastic matrix	i) $\begin{bmatrix} 1 & 2 & 4 \\ 3 & 3 & 3 \\ 1 & 1 & 1 \\ 2 & 1 & 2 \end{bmatrix}$	B) which matrix is a regular matrix	ii) $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 1 \\ 2 & 4 & 4 \\ 0 & 1 & 0 \end{bmatrix}$	C) which matrix is not a stochastic matrix	iii) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}$	I	CO6
A) which matrix is a stochastic matrix	i) $\begin{bmatrix} 1 & 2 & 4 \\ 3 & 3 & 3 \\ 1 & 1 & 1 \\ 2 & 1 & 2 \end{bmatrix}$								
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C) which matrix is not a stochastic matrix	iii) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}$								

5M3	A) If $F_{ii}=1$, the state i is said to be	i) Null- persistent	III	CO6
	B) If $F_{ii} < 1$, the state i is said to be	ii) persistent		
	C) If $\mu_{ii} = \infty$, it is	iii) transient		
5M4	A) $P(X_1 = 1/X_0 = 2)$	i) P_{32}	I	CO6
	B) $P(X_3 = 2/X_3 = 3)$	ii) P_{21}		
	C) $P(X_4 = 0/X_2 = 3)$	iii) P_{41}		
	D) $P(X_0 = 1/X_0 = 4)$	iv) P_{30}		
5M5	A) continuous, continuous	i) discrete stochastic sequence	I	CO6
	B) continuous, discrete	ii) discrete stochastic process		
	C) discrete, continuous	iii) discrete stochastic sequence		
	D) discrete, discrete	iv) continuous stochastic process		
DESCRIPTIVE QUESTIONS				
5D1	Find expected duration of the game (d_z) if $p=\frac{1}{3}$, $q=\frac{1}{2}$, $z=1$ and $a=1000$.		I	CO6
5D2	Ashok bought a share of stock for \$10, and it is believed that the stock price moves (day by day) as a simple random walk with $p = 0.55$. a) What is the probability that Ashok's stock reaches the high value of \$15 before the low value of \$5? b) What is the probability that Ashok will become infinitely rich?		I	CO6
5D3	Identify which of the following are regular matrices? i) $\begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$ ii) $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$ iii) $\begin{bmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & \frac{1}{4} & 0 \end{bmatrix}$		III	CO6
5D4	A fair die is tossed repeatedly. If X_n denotes the maximum of the numbers occurring in the first n tosses, Determine the transition probability matrix P of the Markov chain $\{X_n\}$. Evaluate P^2 and $P(X_2 = 6)$		V	CO6
5D5	Select which of the following are stochastic matrices? i) $\begin{bmatrix} 1 & 0 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$ ii) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$ iii) $\begin{bmatrix} \frac{1}{3} & \frac{2}{3} & \frac{4}{3} \\ \frac{1}{2} & 1 & \frac{1}{2} \end{bmatrix}$		III	CO6
5D6	The transition probability matrix (tpm) is given as follows. Is the matrix $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ irreducible?		IV	CO6
5D7	A training process considered as a two state Markov chain. If it rains, it is considered		I	CO6

	to be in state '0' and it does not rains is in the state of '1'. The transition probability of the Markov chain is defined by $P = \begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$ Find the probability that it will rain for 3 days from today assuming that it is raining today.		
5D8	Three boys A, B and C are throwing a ball to each other. A always throw the ball to B and B always throws the ball to C: but C is just as likely to throw the ball to B as to A. Prove that the process is the Markov chain. Find the transition matrix and classify the states.	V	CO6
5D9	The transition probability matrix (t p m) of a Markov chain $\{X_n\}, 1, 2, 3, \dots$ having three states 1, 2, and 3 is $P = \begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ And the initial distribution is, $P^0 = [0.7, 0.2, 0.1]$ Illustrate (i) $P\{X_2=3\}$ (ii) $P\{X_3=2, X_2=3, X_1=3, X_0=2\}$	II	CO6
5D10	Explain briefly about the stochastic matrix and the Markov process.	II	CO6
5D11	Discuss the nature of states of the Markov chain with tpm $p = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$	VI	CO6
5D12	Find the fixed probability vector for the regular stochastic matrix $\begin{bmatrix} \frac{1}{4} & \frac{2}{4} \\ \frac{3}{4} & \frac{3}{4} \\ \frac{1}{4} & \frac{3}{4} \\ \frac{1}{4} & \frac{1}{4} \end{bmatrix}$	I	CO6
5D13	The transition probability matrix (tpm) of a Markov chain $\{X_n\}, 1, 2, 3, \dots$ having three states 1, 2, and 3 is $P = \begin{bmatrix} \frac{3}{4} & \frac{1}{4} & 0 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ 0 & \frac{3}{4} & \frac{1}{4} \end{bmatrix}$ and the initial distribution is $P(X_0 = i) = \frac{1}{3}i = 0, 1, 2$ Interpret (i) $P(X_1 = 1/X_0 = 2)$ ii) $P(X_2 = 2/X_1 = 1)$ iii) $P(X_2 = 2, X_1 = 1/X_0 = 2)$ iv) $P(X_2 = 2, X_1 = 1, X_0 = 2)$ v) $P(X_3 = 1, X_2 = 2, X_1 = 1, X_0 = 2)$	II	CO6
5D14	Find the value of x, y, z if $\begin{bmatrix} 0 & x & \frac{1}{3} \\ 0 & 0 & y \\ \frac{1}{3} & \frac{1}{3} & z \end{bmatrix}$ is a transition probability matrix	II	CO6
5D15	Suppose that the probability of a dry (state 0) following a rainy day (state 1) is $\frac{1}{3}$ and that the probability of a rainy day following a dry day is $\frac{1}{2}$. Given that May 1 st is a dry day. Find the probability i) May 3 rd is also a dry day ii) May 5 th is also a dry day?	I	CO6

ASSIGNMENT

Sl. No	Assignment Questions	Course Outcome	Books To be Referred	Date of Announcement	Date Of Submission
1	Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same color? (Remembering)	CO1	T1		
2	If S is a sample space, and E_1, E_2 are any two events in S and then prove that $P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$ (Evaluation)	CO1	T1		
3	A fair die is tossed. Let the random variable X denote the twice the number appearing on the die, Write the distribution of X, find the (i) mean (ii) variance. (Remembering)	CO2	T1		
4	If 2% of light bulbs are defective, Find (i) At least one is defective (ii) Exactly 7 are defective (iii) $P(1 < x < 8)$ in a sample of 100. (Remembering)	CO2	T1		
5	For the continuous probability function $f(x) = kx^2 e^{-x}$ when $x \geq 0$, find (i) k (ii) Mean (iii) variance. (Evaluation)	CO3	T2		
6	Find the probability of getting an even number on face 3 to 5 times in throwing 10 dice together. (Remembering)	CO3	R1		
7	What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence. (Remembering)	CO5	T1		
8	In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that the both rice and wheat are equally popular in this state at 1% level of significance? (Analyzing)	CO5	T1		
9	A training process considered as a two state Markov chain. If it rains, it is considered to be in state '0' and it does not rains is in the state of '1'. The transition probability of the Markov chain is defined by $P = \begin{pmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{pmatrix}$ Find the probability that it will rain for 3 days from today assuming that it is raining today. (Remembering)	CO6	T1		
10	Explain briefly about the stochastic matrix and the Markov process. (Understanding)	CO6	T1		

Section – A

Answer All the questions

Marks: 5Qx1M = 5M

1. Define Sample Space. **(Remembering)**
2. Write the statement of Baye's rule. **(Remembering)**
3. Write the Mean and Variance of Binomial Distribution. **(Remembering)**
4. Write the recurrence relation of Poisson distribution. **(Remembering)**
5. Define the uniform distribution of a continuous random variable. **(Remembering)**

Section – B

Answer any FOUR questions

Marks: 4Qx5M = 20

MODEL PAPER MID-I

6. Two dice are thrown. Let A be the event that the sum of the points on the faces is 9. Let B be the event that at least one number is 6.
Find i) $P(A \cup B)$ (ii) $P(A \cap B)$ (iii) $P(A^c \cup B^c)$. **(Remembering)**
7. A bag A contains 2 white and 3 red balls and a bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that the red ball drawn is from the bag B. **(Remembering)**
8. A random variables X has the following probability function

X	-3	-2	-1	0	1	2	3
P(x)	K	0.1	k	0.2	2k	0.4	2k

Find (i) k (ii) Mean (iii) variance **(Remembering)**

9. . If X is Poisson variate such that, $3P(x=4) = 0.5 P(x=2) + P(x=0)$ then find the men of X and $P(x \leq 2)$.
(Remembering)
10. Let X denotes the minimum of the two numbers that appear when a pair of fair dice is thrown once.
Determine, (i) Discrete probability distribution, (ii) Expectation and (iii) variance **(Evaluation)**
11. In a Normal distribution 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution. **(Evaluation)**

MODEL PAPER MID-II

BR-20

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

D4

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

II B.Tech - I Semester -I I Mid Term Examinations

(R20MTH2103) Probability & statistical methods (Common to CSE)

Duration: 90Mins

Max Marks: 25M

Section – A

Answer All the questions

Marks: 5Qx1M = 5M

1. Write the formula for the sample mean, sample variance. **(Remembering)**
2. What is finite population correction factor. **(Remembering)**
3. Define maximum likelihood estimation function. **(Remembering)**
4. Write the test statistic for difference of two proportions. **(Remembering)**
5. Define the Markov process. **(Remembering)**

Section – B

Answer any FOUR questions

Marks: 4Qx5M = 20M

6. Consider all the samples of size 2 are taken from population 3,6,9,15,27 with replacement. Then find
 - i) The populations mean.
 - ii) The population standard deviation.
 - iii) The mean of the sampling distribution of means.
 - iv) The standard deviation of the sampling distribution of means. **(Remembering)**
7. What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence. **(Remembering)**
8. In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that the both rice and wheat are equally popular in this state at 1% level of significance? **(Analyzing)**
9. In two large populations, there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from two populations? **(Analyzing)**
10. Which of the following are regular matrices? **(Remembering)**
$$\left(\begin{array}{ccc} 0 & 0 & 1 \\ i) & 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \end{array} \right) \quad (ii) \left(\begin{array}{ccc} 1/2 & 1/4 & 1/4 \\ 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \end{array} \right) \quad (iii) \left(\begin{array}{ccc} 1/2 & 1/2 & 0 \\ 1/2 & 1/2 & 0 \\ 1/4 & 1/4 & 0 \end{array} \right)$$
11. Three boys A, B and C are throwing a ball to each other. A always throw the ball to B and B always throws the ball to C: but C is just as likely to throw the ball to B as to A. Show that the process is the Markov chain. Find the transition matrix and classify the states. **(Evaluating)**

BR-20

Subject Code: R20MTH2103

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

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

II B.Tech - II Semester – End Examinations model paper

PROBABILITY & STATISTICAL METHODS

(CSE)

Duration: 3 Hrs

Max Marks: 70M

Section – A

Answer All the following questions

Marks: 5Qx4M = 20M

- Two cards are drawn from a well shuffled pack of 52 cards. Find the probability of that they are both aces, if first card is
a) Replaced b) Not replaced
- Define Variance of (i) Discrete Random variable (ii) Continuous random variable. (**Remembering**)
- Write the formula for the sample mean, sample variance. (**Remembering**)
- Explain the procedure of testing of hypothesis. (**Understanding**)
- Define a) Markov process b) Markov chain.

Section – B

Answer any FIVE questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

- If 2% of the light bulbs are defective, find
a) Atleast one is defective
b) Exactly 7 are defective
c) $P(1 < x < 8)$ in a sample of 100
(OR)
- If X is a normal variate with mean 30 and standard deviation 5. Find the probabilities that
a) $26 \leq X \leq 40$
b) $X \geq 45$

UNIT – II

- Find the mean and variance of the uniform probability distribution given by $f(x) = 1/n$ for $x=1,2,3,\dots,n$. (**Remembering**)

(OR)

- Construct a binomial distribution to the following data, (**Applying**)

X	0	1	2	3	4	5	6
f	13	25	52	58	32	16	4

UNIT - III

- In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5, Assuming the distribution to be normal, find
(i) How many students score between 12 and 15?
(ii) How many score above 18
(iii) How many score below 18 (**Remembering**)

(OR)

- Explain briefly t-distribution. (**Understanding**)

UNIT - IV

12. What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence. **(Remembering)**

(OR)

13. The samples of students were drawn from two universities and from their weights in kilograms, means and standard deviations are calculated below. Make a large sample test to test the significance of the difference between the means. **(Creating)**

	Size of sample	Means	S.D's
University A	400	55	10
University B	100	57	15

UNIT - V

14. plain about stochastic process and its classifications.

(OR)

15. Which of the following are stochastic matrices?

- a) $\begin{pmatrix} 1 & 0 \\ 1/2 & 1/2 \end{pmatrix}$
- b) $\begin{pmatrix} 1/2 & -1/2 \\ 1/4 & 3/4 \end{pmatrix}$
- c) $\begin{pmatrix} 1/3 & 2/3 & 4/3 \\ 1/2 & 1 & 1/2 \end{pmatrix}$

COURSE OUTCOMES (CO's)

Academic Year: 2023-24

Class: II YEAR-I SEM IT.

Course Name: COMPUTER ORGANIZATION AND MICROPROCESSOR (R22ECE2116)

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

Course Outcomes (COs)	
C212.1	Able to understand the basic components and the design of CPU,ALU and Control Unit.
C212.2	Ability to understand memory hierarchy and its impact on computer cost/performance.
C212.3	Ability to understand the advantage of instruction level parallelism and pipelining for high performance processor design.
C212.4	Ability to understand the instruction set,instruction formats and addressing modes of 8086.
C212.5	Ability to write assembly language programs to solve problems.

COURSE ARTICULATION MATRIX

COs	Pos												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C2102.1	3	2	-	-	3	-	2	-	-	-	-	2	2	3	2
C2102.2	3	3	-	2	2	-	-	-	-	-	-		3	3	2
C2102.3	3	3	-	2	2	-	2	-	-	-	-		3	3	2
C2102.4	3	2	3	2	-	-	2	-	-	-	-		3	2	1
C2102.5	3	3	3	3	2	-	-	-	3	-	-		3	3	1
C2102.6	3	3	3	3	-	-	2	-	3	-	-		3	3	1
C2102	3	2.6	3	2.6	2.2	-	2	-	3	-	-	2	2.8	2.8	1.5

3: High 2: Medium 1: Low



Lr.No.SICET/AUTO/DAE/II B.Tech (BR-22) Academic Calendar/182/2023

Dt: 01.09.2023

Dr. G. SURESH,
Principal,

To,
All the HODs.

B.TECH II-YEAR (I-SEM & II-SEM) ACADEMIC CALENDAR
ACADEMIC YEAR : 2023-24

Sir,

Sub: SICET (Autonomous) - Academic & Evaluation - Academic Calendar for **B.Tech – II Year** for the academic year **2023-24** – Reg.

The approved Academic Calendar for **B.Tech – II Year (I & II Sem)** for the academic year **2023-24** is given below:

Academic Calendar for B.Tech – II Year Students (2022 - 23 Batch), BR-22 Regulation.

I – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work	13.09.2023 (Wednesday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	13.09.2023 – 21.10.2023	5 Weeks 4 Days
3.	Dasara Vacation.	23.10.2023 – 28.10.2023	1 Week
4.	Continuation of 1 st Spell of Instructions for covering First Two and a half Units.	30.10.2023 – 14.11.2023	2 Weeks 2 Days
5.	I Mid Term Examinations.	15.11.2023 – 18.11.2023	4 Days
6.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before.	23.11.2023	
7.	2 nd Spell of Instructions for covering Remaining Two and a half Units.	20.11.2023 – 12.01.2024	8 Weeks
8.	Sankranti Holidays.	13.01.2024 – 16.01.2024	4 Days
9.	II Mid Term Examinations.	17.01.2024 – 19.01.2024	3 Days
10.	Preparation Holidays & Practical Examination.	20.01.2024 – 27.01.2024	1 Week
11.	Submission of II Mid Term Examination Marks to the Autonomous Section on or before.	25.01.2024	
12.	I Semester End Examinations	29.01.2024 – 10.02.2024	2 Weeks
Commencement of Class-Work for II B.Tech - II Semester 12.02.2024 (Monday)			

II – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work	12.02.2024 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	12.02.2024 – 06.04.2024	8 Weeks
3.	I Mid Term Examinations.	08.04.2024 – 13.04.2024	1 Week
4.	Submission of I Mid Term Examination Marks to the Autonomous Section on or before.	18.04.2024	
5.	2 nd Spell of Instructions for covering Remaining Two and a half Units.	15.04.2024 – 11.05.2024	4 Weeks
6.	Summer Vacation.	13.05.2024 – 25.05.2024	2 Weeks
7.	Continuation of 2 nd Spell of Instructions for covering Remaining Two and a half Units.	27.05.2024 – 22.06.2024	4 Weeks
8.	II Mid Term Examinations.	24.06.2024 – 26.06.2024	3 Days
9.	Preparation Holidays & Practical Examination.	27.06.2024 – 06.07.2024	1 Week 3 Days
10.	Submission of II Mid Term Examination Marks to the Autonomous Section on or before.	02.07.2024	
11.	II Semester End Examinations	08.07.2024 – 20.07.2024	2 Weeks
Commencement of Class-Work for III B.Tech - I Semester 22.07.2024 (Monday)			

ACE

Copy to DAE & Copy to all the Heads of the Depts.

CE

DIRECTOR

PRINCIPAL

Controller of Examination Sri Indu College of Engineering & Technology

PRINCIPAL

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

COMPUTER ORGANIZATION & MICROPROCESSOR

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech - II Year – I Semester

L	T	P	C
3	0	0	

(R22ECE2116) COMPUTER ORGANIZATION AND MICROPROCESSOR

Course Objectives:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors.

Course Outcomes:

- Able to understand the basic components and the design of CPU, ALU and Control Unit.
- Ability to understand memory hierarchy and its impact on computer cost/performance.
- Ability to understand the advantage of instruction level parallelism and pipelining for high performance processor design.
- Ability to understand the instruction set, instruction formats and addressing modes of 8086.
- Ability to write assembly language programs to solve problems.

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

UNIT – II

Central Processing Unit: The 8086 Processor Architecture, Register organization, Physical memory organization, General Bus Operation , I/O Addressing Capability , Special Processor Activities , Minimum and Maximum mode system and timings.

UNIT - III

Assembly Language Programming with 8086 – Machine level programs, Machine coding the programs, Programming with an assembler, Assembly Language example programs. Stack structure of 8086, Interrupts and Interrupt service routines, Interrupt cycle of 8086, Interrupt programming, Passing parameters to procedures, Macros, Timings and Delays.

UNIT – IV

Computer Architecture: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point Arithmetic operations. Input-Output Organization: peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor (IOP), Intel 8089 IOP.

UNIT – V

Memory Organization : Memory Hierarchy , Main Memory, Auxiliary memory , Associate Memory Cache Memory.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline RISC Pipeline, Vector Processing, Array Processors.

TEXT BOOK:

Computer System Architecture – M. Morris Mano, Third Edition, Pearson. (UNITS – I, IV, V)
1.Advanced Microprocessors and Peripherals M Bhurchandi, A.K Ray,3rd edition , McGraw-Hill India Education Private Ltd. (UNITS-II, III).

REFERENCES BOOKS:

1. Microprocessors and Interfacing, D V Hall,SSSP Rao, 3rd edition,McGraw Hill India Education Private Ltd.
2. Carl Hamacher,Zvonko Vranesic,Safwat Zaky:Computer Organization,5th Edition , TataMcGraw Hill,2002
3. Computer Organization and Architecture,William Stallings,9th Edition,Pearson.
4. David A.Patterson,John L.Hennessy:Computer Organization and Design - The Hardware/Software Interface ARM Edition,4th Edition, Elsevier,2009.

WEB-LINKS:

https://onlinecourses.nptel.ac.in/noc21_cs61/preview



**SRI INDU COLLEGE OF
ENGINEERING & TECHNOLOGY
LESSON PLAN**

(Regulation: R22)

Department of Information Technology

Prepared
on Rev1:
Page: 10 of 7

Sub. Code & Title **R22ECE2116 & Computer Organization and Microprocessor**

Academic Year: 2023-24 **Year/Sem./Section** **II-I**

Faculty Name & Designation **Y.Harathi & 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				
UNIT-I								
1	DIGITAL COMPUTERS					11		
1.1	Digital Computers: Introduction	T1	1	11	Black board	01		CO1,L2
1.2	Block diagram of Digital Computer	T1	15	16	Black board	01		CO1,L6
1.3	Definition of Computer Organization, Computer Design and Computer Architecture.	T1	3	4	Black board	01		CO1,L1
1.4	Basic Computer Organization and Design: Instruction codes	T1	111	112	Black board	01		CO1,L2
1.5	Computer Registers	T1	112	115	Black board	01		CO1,L2
1.6	Computer instructions	T1	115	119	Black board	01		CO1, L2
1.7	Timing and Control	T1	125	130	Black board	01		CO1, L1
1.8	Instruction cycle	T1	130	133	Black board	01		CO1, L4
1.9	Memory Reference Instructions	T1	133	135	Black board	01		CO1, L4
1.10	Input – Output and Interrupt.	T1	141	144	Black board	01		CO1, L4
1.11	Complete computer description	T1	144	149	Black board	01		CO1, L1
Review		Signature of the HOD/Coordinator						



**SRI INDU COLLEGE OF
ENGINEERING & TECHNOLOGY
LESSON PLAN**

(Regulation: R22)

Department of Information Technology

Prepared
on Rev1:
Page: 2 of 7

Sub. Code & Title **R22ECE2116 & Computer Organization and Microprocessor**

Academic Year: 2023-24 **Year/Sem./Section** **II-I**

Faculty Name & Designation **Y.Harathi & Assistant Professor**

Unit/ Item No.	Topic	Book Reference	Page (s)	Teaching Methodology	Proposed No. of Periods	Actual Date of	CO/RBT
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	(s)					Handled	
		From	To				
UNIT-II							
2	Central Processing unit					07	
2.1	The 8086 Processor Architecture	T1	235	238	Black board	01	CO2,L1
2.2	Register organization	T1	238	16	Black board	01	CO2,L2
2.3	Physical memory organization	T1	242	4	Black board	01	CO2,L1
2.4	General Bus Operation	T1	253	112	Black board	01	CO2,L2
2.5	I/O Addressing Capability	T1	265	115	Black board	01	CO2,L1
2.6	Special Processor Activities	T1	270	119	Black board	01	CO2,L2
2.7	Minimum and Maximum mode system and timings	T1	278	130	Black board	01	CO2,L3
	Review	Signature of the HOD/Coordinator					

	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY			Prepared on Rev1:	
	LESSON PLAN			Page: 3 of 7	
	(Regulation: R22)				
	Department of Information Technology				
Sub. Code & Title	R22ECE2116 & Computer Organization and Microprocessor				
Academic Year: 2023-24	Year/Sem./Section	II-I			
Faculty Name & Designation	Y.Harathi & 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				
UNIT-III								
3	Assembly Language Programming					09		
3.1	Assembly Language Programming with 8086	T1	81	87	Black board	02		CO3,L2
3.2	Machine Level programs	T1	89	90	Black board	01		CO3,L3
3.3	Machine coding the programs	T1	91	95	Black board	01		CO3,L1
3.4	Programming with an assembler	T1	97	97	Black board	01		CO3,L1
3.5	Assembly Language example programs	T1	365	370	Black board	02		CO3,L3
3.6	Stack structure of 8086 interrupts and interrupt service routines	T1	372	377	Black board	01		CO3,L3
3.7	Interrupt cycle of 8086				Black board	01		CO3,L3

		T1	372	377				
3.8	Interrupt programming	T1	385	393	Black board	01		CO3,L3
3.9	Passing parameters to procedures	T1	395	398	Black board	01		CO3,L3
3.10	Macros	T1	400	402	Black board	01		CO3,L3
3.11	Timing and Delays	T1	403	407	Black board	01		CO3,L3
	Review	Signature of the HOD/Coordinator						

	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY LESSON PLAN (Regulation: R22) Department of Information Technology			Prepared on Rev1: Page: 12 of 7
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	Academic Year: 2023-24	Year/Sem./Section	II-I	
	Faculty Name & Designation	Y.Harathi & 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				
UNIT-IV								
4	Computer Arithmetic					13		
4.1	Introduction	T1	413	421	Black board	01		CO4,L2
4.2	Addition and Subtraction	T1	422	431	Black board	01		CO4,L1
4.3	Multiplication Algorithms	T1	433	437	Black board	01		CO4,L2
4.4	Division Algorithms	T1	437	445	Black board	01		CO4,L1
4.5	Floating –point Arithmetic operations	T1	446	448	Black board	01		CO4,L6
4.6	Input-Output Organization	T1	479	490	Black board	01		CO4,L2
4.7	Peripheral Devices	T1	493	495	Black board	01		CO4,L1
4.9	Asynchronous data transfer	T1	500	508	Black board	01		CO4,L1
4.10	Modes of Transfer	T1	509	511	Black board	01		CO4,L1
4.11	Priority Interrupt	T1	512	515	Black board	01		CO4,L6

4.12	Direct memory Access	T1	516	519	Black board	01		CO4,L2
4.13	Input-Output Processor (IOP)	T1	520	525	Black board	01		CO4,L3
4.14	Intel 8089 IOP	T1	526	527	Black board	01		CO4,L2
	Review	Signature of the HOD/Coordinator						

	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY LESSON PLAN (Regulation: R22) Department of Information Technology			Prepared on Rev1: Page: 13 of 7	
	Sub. Code & Title		R22ECE2116 & Computer Organization and Microprocessor		
	Academic Year: 2023-24		Year/Sem./Section	II-I	
	Faculty Name & Designation		Y.Harathi & 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				
UNIT-V								
5	Memory Organization					14		
5.1	Memory Hierarchy	T1	304	305	Black board	01		CO5,L2
5.2	Main Memory	T1	306	312	Black Board	01		CO5,L2
5.3	Auxiliary memory	T1	323	328	Black board	01		CO5,L1
5.4	Associate Memory	T1	323	328	Black board	01		CO5,L1
5.5	Cache Memory	T1	329	336	Black board	01		CO5,L1
5.6	Parallel Processing	T1	337	343	Black board	01		CO5,L1
5.7	Pipelining		343	348	Black board	01		CO5,L1

		T1						
5.8	Arithmetic Pipeline	T1	348	354	Black board	01		CO5,L3
5.9	Instruction pipeline	T1	354	356	Black board	01		CO5,L2
5.10	RISC Pipeline	T1	529	531	Black board	01		CO6,L2
5.11	Vector Processing	T1	531	539	Black board	01		CO6,L5
5.12	Array Processors	T1	539	544	Black board	01		CO6,L1
	Review	Signature of the HOD/Coordinator						

TEXT BOOK:

Computer System Architecture – M. Morris Mano, Third Edition, Pearson. (UNITS – I, IV, V)
1.Advanced Microprocessors and Peripherals M Bhurchandi, A.K Ray,3rd edition , McGraw-Hill India Education Private Ltd. (UNITS-II, III).

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7. Computer Organization and Architecture,William Stallings,9th Edition,Pearson.
8. David A.Patterson,John L.Hennessy:Computer Organization and Design - The Hardware/Software Interface ARM Edition,4th Edition, Elsevier,2009.

WEB LINKS: https://onlinecourses.nptel.ac.in/noc21_cs61/preview

ASSIGNMENT- I

S.No.	Assignment Questions	Course Outcome	Books to be Referred
Set-1: Roll no's 1-5			
1	Define computer architecture?	CO1	T1
2.	Define a digital computer?	CO1	T1
3.	Draw and explain about 8086 processor architecture?	CO2	T1
4.	What are the features of 8086 microprocessor?	CO2	T1
5.	Explain about assembly language?	CO3	T1
Set-2: Roll no's 6-10			
1	What is the need of register?	CO1	T1
2.	Explain the different types of register?	CO1	T1
3.	Explain register organization in detail with neat diagrams?	CO2	T1
4.	Draw and Explain about physical memory organization?	CO2	T1
5.	What are the steps involved in assembly program development?	CO3	T1
Set-3: Roll no's 11-15			
1	What is instruction format?	CO1	T1
2.	Explain the different instruction formats in detail?	CO1	T1
3.	Explain about Minimum mode timing signals of 8086 microprocessor?	CO2	T1
4.	Explain about Maximum mode timing signals of 8086 microprocessor?	CO2	T1
5.	Draw and Explain the stack structure of 8086 microprocessor?	CO3	T1
Set-4: Roll no's 16-20			
1	Discuss timing and control?	CO1	T1
2.	Explain about ALU?	CO1	T1
3.	Discuss about addressing modes of 8086 microprocessor?	CO2	T1
4.	Explain instruction set of 8086 microprocessor?	CO2	T1

5.	Explain different types of interrupts?	CO3	T1
Set-5: Roll no's 21-25			
1	Explain the different phases of Instruction cycle?	CO1	T1
2.	List and Explain in detail about the memory reference instructions?	CO1	T1
3.	Explain about I/O Addressing capability?	CO2	T1
4.	Explain about special processor activities?	CO2	T1
5.	Draw and Explain about interrupt vector table?	CO3	T1
Set-6: Roll no's 26-30			
1	Draw the flowchart for interrupt cycle and experiment with it with explanation?	CO1	T1
2.	Determine the input-output configuration?	CO1	T1
3.	What are the features of 8086 microprocessor?	CO2	T1
4.	Draw and Explain about physical memory organization?	CO2	T1
5.	Explain about assembly language?	CO3	T1
Set-7: Roll no's 31-35			
1	Define a digital computer?	CO1	T1
2.	Explain about execution unit?	CO1	T1
3.	Discuss about flag register?	CO2	T1
4.	Explain about physical memory organization?	CO2	T1
5.	Explain different types of interrupts?	CO3	T1
Set-8: Roll no's 36-40			
1	Draw and Explain about interrupt vector table?	CO3	T1
2.	Explain about segment registers?	CO1	T1
3.	Explain instruction set of 8086 microprocessors?	CO2	T1
4.	List and Explain in detail about the register reference instructions?	CO1	T1
5.	Draw block diagram of digital computer?	CO1	T1
Set-9: Roll no's 41-45			
1	What is instruction format?	CO1	T1
2.	Determine the input-output configuration?	CO1	T1
3.	Explain general purpose registers in detail?		

		CO1	T1
4.	Draw and Explain about 8086 processor architecture?	CO2	T1
5.	Explain about Minimum mode timing signals of 8086 microprocessor?	CO2	T1
Set-10: Roll no's 46-50			
1	Explain about special processor activities?	CO2	T1
2.	Discuss about addressing modes of 8086 microprocessor?	CO2	T1
3.	What are the steps involved in assembly program development?	CO3	T1
4.	Explain about 8086 processor architecture?	CO2	T1
5.	Explain offset registers?	CO2	T1
Set-11: Roll no's 51-55			
1	Explain the different types of registers?	CO1	T1
2.	What is the need of registers?	CO1	T1
3.	Explain about BIU?	CO1	T1
4.	Explain in detail about I/O Reference instructions?	CO1	T1
5.	Determine the conditional code flags?	CO2	T1
Set-12: Roll no's 56-60			
1	Explain about ALU?	CO1	T1
2.	Explain about EU?	CO1	T1
3.	Explain general purpose registers in detail?	CO1	T1
4.	Explain about physical memory organization?	CO2	T1
5.	Draw and Explain the stack structure of 8086 microprocessor?	CO2	T1
Set-13: Roll no's 61-65			
1	Define computer architecture?	CO1	T1
2.	Define a digital computer?	CO1	T1
3.	Draw and explain about 8086 processor architecture?	CO2	T1
4.	What are the features of 8086 microprocessor?	CO2	T1
5.	Explain about assembly language?	CO3	T1
Set-14: Roll no's 66-70			
1	Draw the flowchart for interrupt cycle and experiment with it with	CO1	T1

	explanation?		
2.	Determine the input-output configuration?	CO1	T1
3.	What are the features of 8086 microprocessor?	CO2	T1
4.	Draw and Explain about physical memory organization?	CO2	T1
5.	Explain about assembly language?	CO3	T1

ASSIGNMENT- II

S.No.	Assignment Questions	Course Outcome	Books to be Referred
Set-1: Roll no's 1-5			
1	Explain about interrupt cycle of 8086 microprocessor?	CO3	T1
2	Explain briefly about computer arithmetic?	CO4	T1
3	Explain about addition and subtraction?	CO4	T1
4	Draw and explain about memory hierarchy?	CO5	T1
5	What is main memory and Explain about RAM and ROM chip?	CO5	T1
Set-2: Roll no's 6-10			
1	Discuss about Macros?	CO3	T1
2	Discuss about booth multiplication algorithm for signed – 2's complement numbers?	CO4	T1
3	Explain division algorithm with flowchart?	CO4	T1
4	Explain about auxiliary memory in detail?	CO5	T1
5	Explain about associate memory?	CO5	T1
Set-3: Roll no's 11-15			
1	Differentiate between Timings and Delays?	CO3	T1
2	Explain floating-point arithmetic operations?	CO4	T1
3	Describe peripheral devices?	CO4	T1
4	Write about cache memory?	CO5	T1

5	Describe pipelining and vector processing?	CO5	T1
Set-4: Roll no's 16-20			
1	Explain about passing parameters to procedures?	CO3	T1
2	Determine the Input-Output interface?	CO4	T1
3	Explain about asynchronous data transfer?	CO4	T1
4	Explain parallel processing and its function units?	CO5	T1
5	Differentiate between arithmetic pipeline and instruction pipeline?	CO5	T1
Set-5: Roll no's 21-25			
1	Differentiate between software and hardware interrupts?	CO4	T1
2	Explain modes of transfer?	CO4	T1
3	What is priority interrupt?	CO4	T1
4	Explain about RISC pipeline?	CO5	T1
5	Draw and explain about array processors?	CO5	T1
Set-6: Roll no's 26-30			
1	Differentiate between software and hardware interrupts?	CO4	T1
2	Explain about passing parameters to procedures?	CO3	T1
3	Explain briefly about computer arithmetic?	CO4	T1
4	Explain about addition and subtraction?	CO4	T1
5	Draw and explain about memory hierarchy?	CO5	T1
Set-7: Roll no's 31-35			
1	What is main memory and Explain about RAM and ROM chip?	CO5	T1
2	Explain about auxiliary memory in detail?	CO5	T1
3	Draw and explain about Input-Output processor?	CO4	T1
4	Draw and explain the block diagram of DMA controller?	CO4	T1

5	Discuss about Macros?	CO3	T1
Set-8: Roll no's 36-40			
1	Explain about interrupt cycle of 8086 microprocessor?	CO3	T1
2	Discuss about booth multiplication algorithm for signed – 2's complement numbers?	CO4	T1
3	Describe peripheral devices?	CO4	T1
4	Explain about associate memory?	CO5	T1
5	Write about cache memory?		T1
Set-9: Roll no's 41-45			
1	Explain about passing parameters to procedures?	CO3	T1
2	Explain division algorithm with flowchart?	CO4	T1
3	Explain floating-point arithmetic operations?	CO4	T1
4	Explain about RISC pipeline?	CO5	T1
5	Draw and explain about array processors?	CO5	T1
Set-10: Roll no's 46-50			
1	Differentiate between software and hardware interrupts?	CO4	T1
2	Describe peripheral devices?	CO4	T1
3	Determine the Input-Output interface?	CO4	T1
4	Draw and explain about memory hierarchy?	CO5	T1
5	What is main memory and Explain about RAM and ROM chip?	CO5	T1
Set-11: Roll no's 51-55			
1	Explain about auxiliary memory in detail?	CO5	T1
2	Explain about asynchronous data transfer?	CO5	T1
3	Explain modes of transfer?	CO4	T1
4	What is priority interrupt?	CO4	T1

5	Explain about interrupt cycle of 8086 microprocessor?	CO3	T1
Set-12: Roll no's 56-60			
1	Discuss about Macros?	CO3	T1
2	Explain briefly about computer arithmetic?	CO3	T1
3	Explain about addition and subtraction?	CO4	T1
4	Draw and explain about memory hierarchy?	CO5	T1
5	What is main memory and Explain about RAM and ROM chip?	CO5	T1
Set-13: Roll no's 61-65			
1	Differentiate between Timings and Delays?	CO3	T1
2	Discuss about booth multiplication algorithm for signed – 2's complement numbers?	CO4	T1
3	Explain division algorithm with flowchart?	CO4	T1
4	Explain about auxiliary memory in detail?	CO5	T1
5	Explain about associate memory?	CO5	T1
Set-14: Roll no's 66-70			
1	Differentiate between software and hardware interrupts?	CO3	T1
2	Draw and explain the block diagram of DMA controller?	CO4	T1
3	Draw and explain about Input-Output processor?	CO4	T1
4	Explain about RISC pipeline?	CO5	T1
5	Draw and explain about array processors?	CO5	T1



SRI INDU COLLEGE OF ENGG & TECH

Question Bank

(Regulation: R22)

Department of Information Technology

Prepared on
Rev1:
Page:1 of 9

Sub. Code & Title	R22ECE2116 & Computer Organization & Microprocessor
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Academic Year: 2023-24	Year/Sem./Section	II/I
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Faculty Name & Designation	Y Harathi & ASSISTANT PROFESSOR
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QUESTION BANK WITH BLOOMSTAXONOMY LEVEL (BTL)

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

UNIT - I: Digital Computers

**OBJECTIVE TYPE QUESTIONS
½ MARK QUESTIONS**

**BT
Level**

**Course
Outcome**

1.	What is computer organization? a) structure and behavior of a computer system as observed by the user b) structure of a computer system as observed by the developer c) structure and behavior of a computer system as observed by the developer d) All of the mentioned	1	CO1
2.	Which of the following is a type of computer architecture? a) Microarchitecture b) Harvard Architecture c) Von-Neumann Architecture d) All of the mentioned	2	CO1
3.	Which of the following is the subcategories of computer architecture? a) Microarchitecture b) Instruction set architecture c) Systems design d) All of the mentioned	2	CO1
4.	The small extremely fast, RAM's all called as _____ a) Heaps b) Accumulators c) Stacks d) Cache	4	CO1

5.	Permanent memory of a computer is known as a) RAM b) CD-ROM c)ROM d)CPU	1	CO1
6.	Which of the following operation is mainly performed by RAM? a) Read only b) Read and write c) write only d) depends on the system	2	CO1
7.	The central processing unit consist of a) ALU and Control unit only b) ALU, Control unit and Registers only c) ALU, Control unit and System bus only d) ALU, Control unit, Registers and System bus only	2	CO1
8.	Which of the following is a group of bits that tells the computer to perform particular operation? a) Accumulator b) Register c)Instruction code d)None of the above	2	CO1
9.	Where is the document temporarily stored working on a document of PC? a) ROM b) CP U c)RAM d)Flash memory	5	CO1
10	Which of the following is known as the step by step procedure to solve a program? a) Graph b) Table c) Algorithm d) None of the above	2	CO1
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	Digital computers use _____ system, to carry out arithmetic operations.	2	CO1
2.	Control unit is the major component of _____.	1	CO1
3.	_____ is a set of instruction or programs instructing a computer to do specific tasks.	3	CO1
4.	The _____ memory is high-speed memory available inside CPU to speed up access to data and instructions stored in RAM.	2	CO1
5.	CPU stands for _____	1	CO1
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome

1.	1. Hardware 2. Software 3. Program 4. System software	a) Sequence of instructions b) Collection of programs c) Consists of instructions d) Consists of electronic components	2	CO1
2.	1. Program counter 2. Address register 3. Data register 4. Accumulator	a) 12 bits b) 16 bits c) 12 bits d) 16 bits	2	CO1
3.	1. Output register 2. Input register 3. Temporary register 4. Instruction register	a) 16 bits b) 16 bits c) 8 bits d) 8 bits	2	CO1
4.	1. Data register 2. Address register 3. Instruction register 4. Temporary register	a) Holds temporary data b) Holds instruction code c) Holds memory address d) Holds memory operand	5	CO1
5.	1. Functional instructions 2. Transfer instructions 3. Control instructions 4. Input/output instructions	a) INP, OUT b) BUN, BSA c) LDA, STA S d) ADD, CMA	3	CO1
	5 MARKS QUESTIONS		BT Level	Course Outcome
1.	Define Computer Architecture.		1	CO1
2.	Define a Digital Computer. Draw block diagram of Computer.		1	CO1
3.	What is the need of Register? Explain the different types of Registers?		1	CO1
4.	What is instruction format? Explain the different instruction formats in detail		5	CO1
5.	Discuss Timing and Control.		2	CO1
6.	Explain About ALU?		2	CO1
7.	Explain the different phases of Instruction Cycle?		2	CO1
8.	List and Explain in detail about the memory reference Instructions?		1	CO1
9.	Draw the flowchart for interrupt cycle and experiment with it with explanation		3	CO1
10.	Determine the input-output configuration		3	CO1
Unit -II : CENTRAL PROCESSING UNIT				
	OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS		BT Level	Course Outcome

1.	What is the advantage of Hexadecimal system? a) It uses less memory to store more numbers. b) It uses more memory to store less numbers. c) It uses less memory to store more characters. d) It uses more memory to store less characters	1	CO2
2.	8086 microprocessor has	2	CO2

	a) 15 data lines and 20 address lines b) 16 data lines and 20 address lines c) 15 data lines and 30 address lines d) none of the above		
3.	Which of the following is not a working principle of microprocessor? a) Fetch b) Process c) Decode d) Execution	2	CO2
4.	BIU contains how many segment registers? a) 5 b) 4 c) 3 d) 2	4	CO2
5.	Which flag indicates an overflow condition for the arithmetic operations? a) Parity flag b) Auxiliary flag c) carry flag d) zero flag	5	CO2
6.	Which of the following is an example of register addressing? a) MOV AX, [BX] b) ADD AL, [0301] c) ADD AX, 4836H d) MOV AX, CX	1	CO2
7.	Minimum mode is a _____ microprocessor configuration. a) single b) multi c) both a and b d) None of the above	2	CO2
8	Among the following which one is very fast and efficient? a) RAM b) ROM c) External memory d) Register	4	CO2
9	The work of EU is a) Encoding b) Decoding c) Processing d) Calculations	1	CO2
10	Which of the following is not a features of 8086? a) It uses two stages of pipelining b) It is available in 3 versions based on the frequency of operation c) Fetch stage can prefetch up to 6 bytes of instructions d) It has 512 vectored interrupts.	2	CO2
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Cours e Outcom e

1.	BIU stands for -----	1	CO2
2.	8086 processor is divided into two independent functional units ----- ---- and	2	CO2
3.	Stack pointer is a-----bit register.	2	CO2
4.	The maximum mode system timing diagrams are divided in two ----- portions as ---and timing signals.	5	CO2
5.	The 16bit register DX is used as 16bit -----	2	CO2
MATCH THE FOLLOWING1 MARK QUESTIONS		BT Level	Course Outcom e
1.	1.AX Register 2.BX Register 3.CX Register 4.DX Register	a) Data register b) Counter register c) Base register d) Accumulator	1 CO2
2.	1.General purpose registers 2.Pointer registers 3.Indexed registers 4.Instruction pointer	a) AX, BX, CX, DX b) SI, DI c) SP, BP d) IP	2 CO2
3.	1.STC 2.CLC 3.CMC 4.CLD	a) It clears the direction flag to 0 b) It complements the carry flag c) It clears the carry flag to 0 d) It sets the carry flag to 1	2 CO2
4.	1. ALU Performs 2. Control unit controls 3.Bus 4. Address bus	a) instructions and flow of data b) Arithmetic and logical operations c) Specify memory locations d) Group of conducting wires	4 CO2
5.	1.Queue 2.Queue exhibits 3.BIU 4.EU	a) Handles all transactions b) Execute instructions c) FIFO d) Pipelining	2 CO2
5 Marks Questions			
1	Draw and explain about 8086 Processor Architecture. S	2	CO2
2.	What are the features of 8086 microprocessor.	1	CO2
3.	Explain register organization in detail with neat diagrams.	2	CO2
4.	Draw and explain about physical memory organization.	2	CO2
5.	Explain about Minimum mode timing signals of 8086 microprocessor?	2	CO2
6.	Explain about Maximum mode timing signals of 8086 microprocessor?	2	CO2
7.	Discuss about addressing modes of 8086 microprocessor?	2	CO2
8.	Explain instruction set of 8086 microprocessors?	2	CO2
9.	Explain about I/O Addressing capability?	2	CO2

10	Explain about special processor activities?	2	CO2
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Unit – III : ASSEMBLY LANGUAGE PROGRAMMING WITH 8086

	OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS	BT Level	Course Outcom e
1.	What is the function of opcode in assembly language? a) Represents the memory location b) Provide the information and data required c) Tells the computer what operation to do d) Represents the address of program	1	CO3
2.	Which of the following converts source file to object file? a) Compiler b) Assembler c) Linker and Loader d) All of these	2	CO3
3	For writing a program in assembly language one needs a) NE editor b) MASM Assembler c) Linker and Debug utility of DOS d) All of these	2	CO3
4.	Which of the following TYPE represents the break-point interrupt? a) TYPE 1 b) TYPE 0 c) TYPE 4 d) TYPE 3	4	CO3
5	Which of the following instruction is 1-byte instruction having opcode CCH a) INT1 – Interrupt instruction with type number b) INT3- Break point interrupt instruction c) INTO-Interrupt on overflow instruction d) None of these	2	CO3
6.	TRAP is a ----- interrupt which has the----- priority than maskable interrupt a) Maskable, Lowest b) Non-maskable, Highest c)Maskable, Second lowest d)Non-maskable, second highest	2	CO3
7.	A macro within the macro is called a) macro-within-macro b) nested macro c) macro-n-macro d) none of these	2	CO3
8	The time required for execution of a macro is- that of procedure a) greater than b) less than c) equal to d) greater than or equal to	4	CO3
9.	Which of the following is incorrect? a) compile code of instruction string is inserted at each place, where ever macro name appears	2	CO3

	b) Macro requires less time of execution than that of procedure c) Macro uses stack memory d) Macro name can be anything except registers and mnemonics		
10.	Which of the following techniques are used to pass input data to procedures in ALP? a) Using global declared variable b) Using memory locations c) Using stack d) All of these	2	CO3
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
1.	Assembly language is the human readable notation of -----	2	CO3
2.	----- is a processor understandable language.	1	CO3
3.	MASM reads source program as an ----- and provides object files as -----	3	CO3
4.	The stack is a block of -----	1	CO3
5.	Interrupt means -----	1	CO3
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome
1.	1. Labels 2. Operands 3. Comment 4. Assembler	a) Provide data and information b) Symbol c) Ignores the text in a line d) Symbolic names	2 CO3
2.	1. Stack 2. LIFO 3. Stack pointer 4. Stack segment register	a) offset of the memory location b) Stack c) base address d) block of memory	3 CO3
3.	1. NMI 2. INTR 3. INTA 4. CS	a) Maskable interrupt request pin b) interrupt acknowledge c) non-maskable interrupt d) code segment	1 CO3
4.	1. Type 0 interrupt 2. Type 1 interrupt 3. Type 3 interrupt 4. Type 4 interrupt	a) break-point interrupt b) overflow interrupt c) single-step execution d) division by zero situation	2 CO3
5.	1. Nested macro 2. Macro requires 3. Directives 4. MACRO displays	a) large memory space b) MACRO and ENDM c) with in a macro d) messages MSG on the CRT	2 CO3
	5 MARKS QUESTIONS		
1.	Explain about assembly language?	2	CO3
2.	What are the steps involved in assembly program development?	2	CO3

3.	Draw and explain the stack structure of 8086 microprocessor?	2	CO3
4.	Explain different types of interrupts?	2	CO3
5.	Draw and explain about interrupt vector table?	2	CO3
6.	Explain about interrupt cycle of 8086 microprocessor?	2	CO3
7.	Discuss about Macros?	2	CO3
8.	Differentiate between Timings and Delays?	2	CO3
9.	Explain about passing parameters to procedures?	2	CO3
10.	Differentiate between software and hardware interrupts?	2	CO3

Unit-IV : COMPUTER ARITHMETIC**OBJECTIVE TYPE QUESTIONS
½ MARK QUESTIONS****BT
Level****Course
Outcom
e**

1.	Signed – magnitude is a representation of which binary numbers a) Negative b) Positive c) 0 d) All of these	1	CO4
2.	The EX-OR gate provides 0,1 as output when signs are a) Identical , Different b) Different, Different c) Identical, Identical d) Different, Identical	1	CO4
3.	Double-Length product will be stored in which of the following? a) A and Q b) A and E c) SC d) None of these	2	CO4
4.	Division algorithm is performed by a process of a) Shift and Add operations b) Shift and subtract operations c) Compare, shift and subtract operations d) Shift, Compare and subtract operations	4	CO4
5.	Which of the following is not a input device a) Mouse b) Keyboard c) Scanner d) Printer	2	CO4
6.	What is the function of format effectors ? a) Separate data into paragraph and pages b) Control the layout of printing c) Transmission of text between remote terminals d) All of these	1	CO4
7.	Number of characters in ASCII ----- a) 132 b) 126 c) 128 d) 96	1	CO4
8.	The I/O Bus consist of? a) Data lines b) Address lines c) Control lines d) All of these	1	CO4
9.	In asynchronous data transfer which type of techniques is used? a) Start bit b) Stop bit c) Strobe control	2	CO4

	d) Control bit		
10.	The DMA controller has----- registers a) 4 b) 3 c) 2 d) 1	2	CO4
	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcom e
1.	Data is manipulated by using the ----- in digital computers.	2	CO4
2.	Signed-magnitude representation used for the representation of mantissa for ----- ----- by most computers.	2	CO4
3.	Multiplication of two fixed point binary numbers in signed-magnitude representation is done with process of successive ----- and ----- operation.	3	CO4
4.	ASCII stands for -----	1	CO4
5.	The I/O Bus consists of -----, ----- and -----	5	CO4
	MATCH THE FOLLOWING1 MARK QUESTIONS	BT Level	Course Outcom e
1.	1. Input devices 2. Output devices 3. Processor provides 4. Control lines are referred as a) Function code b) I/O command c) Printer, Voice d) keyboard, Mouse	1	CO4
2.	1. Programmed I/O operations are 2. Interface 3. F=1 4. F=0 a) accepts the data b) CPU reads the data register c) Disables the data accepted line d) The results of I/O instructions	2	CO4
3.	1. SP←-SP-1 2. M[SP]←-PC 3. INTACK←-1 4. PC←-VAD a) Transfer vector address to PC b) Decrement stack pointer c) Push PC into stack d) Enable interrupt acknowledge	3	CO4
4.	1. DMA Burst 2. Cycle Stealing 3. Address register 4. Word count register a) Allows the DMA Controller b) Consisting of a number of memory words c) WC holds the number of words d) Contains an address	2	CO4
5.	1. CPU 2. IOP 3. Memory 4. Data formats a) Provides the path b) Occupies the central position c) Differ from CPU and Memory SS d) Responsible for processing data	2	CO4
	5 MARKS QUESTIONS		
1.	Explain briefly about computer arithmetic?	2	CO4
2.	Explain about addition and subtraction?	2	CO4
3.	Discuss about booth multiplication algorithm for signed – 2's complement numbers?	2	CO4
4.	Explain division algorithm with flowchart?	4	CO4

5.	Explain floating-point arithmetic operations?	3	CO4
6.	Describe peripheral devices?	5	CO4
7.	Determine the Input-Output interface?	2	CO4
8	Explain about asynchronous data transfer?	2	CO4
9	Explain modes of transfer?	2	CO4
10	What is priority interrupt?	1	CO4
11	Draw and explain the block diagram of DMA controller?	3	CO4
12	Draw and explain about Input-Output processor?	3	CO4

Unit-V: MEMORY ORGANIZATION

	OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS	BT Level	Course Outcom e
1.	The device that provides backup storage is ----- a) Register b) Main memory c) Cache d) Auxiliary memory	2	CO5
2.	What is true about memory unit? a) A memory unit is a collection unit of storage unit or devices together b) The memory unit stores the binary information in the form of bits c) Both A and B d) None of these	1	CO5
3.	The ROM chip has ----- bytes and needs --- address lines a) 128,7 b) 132,7 c) 512,9 d) 516,9	2	CO5
4.	Which of the following is correct example for auxiliary memory? a) Magnetic disk b) Flash memory c) Magnetic tapes d) Both A and C	2	CO5
5.	What is the formula for hit ratio? a) Hit/(Hit + Miss) b) (Hit + Miss)/Hit c) Miss/ (Hit + Miss) d) (Hit+Miss)/Miss	1	CO5
6.	Which one is not true about memory hierarchy in a computer system? a) Access time increases b) Cost per bit increases c) Capacity increases d) Frequency of access by the processor decreases	2	CO5
7.	Flynn's classification of computer into 4 major groups are : a) MISD b) SIS D c)SIDM d) Both A and B	4	CO5
8.	Collection of processing segment : a) Vector processing b) Pipeline processing c) Array processing d) All of these	6	CO5
9.	Arithmetic pipeline is used for? a) Integer operations b) Floating point operations c) Character operations d) None of these	4	CO5

10.	In arithmetic pipeline addition and subtraction can be performed in ---- ---- segments a) 2 b) 3 c) 4 d) 5	2	CO5
FILL IN THE BLANKS ½ MARK QUESTIONS		BT Level	Course Outcom e
1.	Memory unit is an essential component needed for ----- and ----- -----	1	CO5
2.	Memory unit that communicates directly with the -----	2	CO5
3.	----- is the central storage unit in a computer system.	3	CO5
4.	Devices that provide----- are called auxiliary memory.	4	CO5
5.	----- is placed between the CPU and the Main memory.	1	CO5
MATCH THE FOLLOWING1 MARK QUESTIONS		BT Level	Course Outcom e
1.	1.Location 2.Capacity 3.Unit of transfer 4.Access method	a) Sequential b) Word c) Number of bytes d) Internal, External	2 CO5
2.	1.Static RAM 2.Dynamic RAM 3. ROM 4. Boot strap loader	a) Store program b) Consists of internal flip flag c) Stores the binary information d) Loads a portion of OS	2 CO5
3.	1.Backup storage 2.Magnetic disks and tapes 3.Argument register 4.key register	a) Auxiliary devices b) Holds external argument c) Auxiliary memory d) Mask for choosing a particular field	2 CO5
4.	1.SISD stream 2.SIMD stream 3.MISD stream 4.MIMD stream	a) Multiple instruction stream, multiple data b) Multiple instruction stream, single data c) Single instruction stream, single data d) Single instruction stream, multiple data	1 CO5
5.	1.Segment 1 address 2.Segment 2 3.Segment 3 4.Segment 4	a) Decode instruction and calculate effective b) Fetch instruction from memory c) Execute instruction d) fetch operand from memory	3 CO5
5 MARKS QUESTIONS		BT Level	Course Outcom e
1.	Draw and explain about memory hierarchy?	2	CO5
2.	What is main memory and Explain about RAM and ROM chip?	1	CO5
3.	Explain about auxiliary memory in detail?	1	CO5
4.	Explain about associate memory?	1	CO5
5.	Write about cache memory?	1	CO5

6.	Describe pipelining and vector processing?	2	CO5
7.	Explain parallel processing and its function units?	1	CO5
8.	Differentiate between arithmetic pipeline and instruction pipeline?	5	CO5
9.	Explain about RISC pipeline?	1	CO5
10.	Draw and explain about array processors?	2	CO5

MID QUESTION PAPERS
&
END SEMESTER QUESTION PAPERS

(For CSIT and IT)

Duration: 2 Hrs

Dt: 18-11-2023, Day-2 (AN)

Max Marks: 30M

Part – AAnswer All multiple choice questions.

Marks: 10Qx1/2M = 5M

- | * (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.) | | *Blooms
Taxonomy
Levels | Course
Outcomes |
|---|-------|-------------------------------|--------------------|
| 1. Which of the following are the subcategories of computer architecture?
A) Microarchitecture B) Instruction set architecture
C) Systems design D) All of the mentioned. | [] | II | CO1 |
| 2. Permanent memory of a computer is known as.
A) RAM B) CD-ROM C) ROM D) CPU. | [] | I | CO1 |
| 3. Which of the following is a group of bits that tells the computer to perform particular operation?
A) Accumulator B) Register C) Instruction code D) None of the above. | [] | II | CO1 |
| 4. Which of the following is known as the step by step procedure to solve a program?
A) Graph B) Table C) Algorithm D) None of the above. | [] | II | CO1 |
| 5. What is the advantage of Hexadecimal system?
A) It uses less memory to store more numbers
B) It uses more memory to store less numbers
C) It uses less memory to store more characters
D) It uses more memory to store less characters | [] | I | CO2 |
| 6. BIU contains how many segment registers?
A) 5 B) 4 C) 3 D) 2. | [] | IV | CO2 |
| 7. Which of the following is an example of register addressing?
A) MOV AX, [BX] B) ADD AL, [0301]
C) ADD AX, 4836H D) MOV AX, CX. | [] | I | CO2 |
| 8. Minimum mode is a _____ microprocessor configuration.
A) Single B) Multi C) Both A and B D) None of the above. | [] | II | CO2 |
| 9. For writing a program in assembly language one need.
A) NE editor B) MASM Assembler
C) Linker and Debug utility of DOS D) All of these. | [] | II | CO3 |
| 10. Which of the following instruction is 1-byte instruction having opcode CCH.
A) INT1 – Interrupt instruction with type number
B) INT3- Break point interrupt instruction
C) INTO-Interrupt on overflow instruction
D) None of these. | [] | II | CO3 |

Answer All fill in the blank questions.

Marks: 6Qx1/2M = 3M

- | | | |
|---|----|-----|
| 11. Digital computers use _____ system, to carry out arithmetic operations. | II | CO1 |
| 12. Control unit is the major component of _____. | I | CO1 |
| 13. The _____ memory is high-speed memory available inside CPU to speed up access to data and instructions stored in RAM. | II | CO1 |
| 14. BIU stands for _____. | I | CO2 |
| 15. Stack pointer is a _____ bit register. | II | CO2 |
| 16. _____ is a processor understandable language. | I | CO3 |

P.T.O

Answer All Match the following questions.

Marks: 2Qx1M = 2M

17.	1.	Program counter	a)	12 bits	II	CO1
	2.	Address register	b)	16 bits		
	3.	Data register	c)	12 bits		
	4.	Accumulator	d)	16 bits		
18.	1.	Queue	a)	Handles all transactions	II	CO2
	2.	Queue exhibits	b)	Execute instructions		
	3.	BIU	c)	FIFO		
	4.	EU	d)	Pipelining		

Part - B

Answer any FOUR questions.

Marks: 4Qx5M = 20M

19.	Draw the block diagram Digital Computer and explain in detail.	I	CO1
20.	List and Explain in detail about the memory reference Instructions?	I	CO1
21.	Determine the input-output configuration	III	CO1
22.	Draw and explain about 8086 Processor Architecture.	II	CO2
23.	Draw and explain about physical memory organization.	II	CO2
24.	Draw and explain about interrupt vector table?	II	CO3

Part - AAnswer All multiple choice questions.

Marks: 10Qx1/2M = 5M

* (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.)

Bloom's
Taxonomy
LevelsCourse
Outcomes

- | | | | |
|---|-----|----|-----|
| 1. TRAP is a _____ interrupt which has the _____ priority than maskable interrupt.
A) Maskable, Lowest
B) Non-maskable, Highest
C) Maskable, Second lowest
D) Non-maskable, Second highest. | [] | II | CO3 |
| 2. The time required for execution of a macro is _____ that of procedure.
A) Greater than
B) Less than
C) Equal to
D) Greater than or Equal to. | [] | IV | CO3 |
| 3. The EX-OR gate provides 0,1 as output when signs are.
A) Identical, Different
B) Different, Different
C) Identical, Identical
D) Different, Identical. | [] | I | CO4 |
| 4. Division algorithm is performed by a process of.
A) Shift and Add operations
B) Shift and Subtract operations
C) Compare, Shift and Subtract operations
D) Shift, Compare and Subtract operations. | [] | IV | CO4 |
| 5. Number of characters in ASCII.
A) 132
B) 126
C) 128
D) 96. | [] | I | CO4 |
| 6. In a synchronous data transfer which type of techniques is used?
A) Start bit
B) Stop bit
C) Strobe control
D) Control bit. | [] | II | CO4 |
| 7. The device that provides backup storage is
A) Register
B) Main memory
C) Cache
D) Auxiliary memory. | [] | II | CO5 |
| 8. The ROM chip has _____ bytes and needs _____ address lines.
A) 128, 7
B) 132, 7
C) 512, 9
D) 516, 9. | [] | II | CO5 |
| 9. Collection of processing segment.
A) Vector processing
B) Pipeline processing
C) Array processing
D) All of these. | [] | VI | CO5 |
| 10. Arithmetic pipeline is used for.
A) Integer operations
B) Floating point operations
C) Character operations
D) None of these. | [] | IV | CO5 |

Answer All fill in the blank questions.

Marks: 6Qx1/2M = 3M

- | | | |
|--|-----|-----|
| 1. Interrupt means _____. | I | CO3 |
| 2. Multiplication of two fixed point binary numbers in signed-magnitude representation is done with process of successive _____ and _____ operation. | III | CO4 |
| 3. The I/O Bus consists of _____, _____ and _____. | V | CO4 |
| 4. Memory unit that communicates directly with the _____. | II | CO5 |
| 5. Devices that provide _____ are called auxiliary memory. | IV | CO5 |
| 6. _____ is placed between the CPU and the Main memory. | I | CO5 |

Answer All Match the following questions.

Marks: 2Qx1M = 2M

17.	1. Nested macro	a)	Large memory space	II	CO3
	2. Macro requires	b)	MACRO and ENDM		
	3. Directives	c)	Within a macro		
	4. MACRO displays	d)	Messages MSG on the CRT		
18.	1. $SP \leftarrow SP-1$	a)	Transfer vector address to PC	III	CO4
	2. $M[SP] \leftarrow PC$	b)	Decrement stack pointer		
	3. $INTACK \leftarrow 1$	c)	Push PC into stack		
	4. $PC \leftarrow VAD$	d)	Enable interrupt acknowledge		

Part - B

Answer any FOUR questions.

Marks: 4Qx5M = 20M

- | | | |
|---|-----|-----|
| 19. Explain about interrupt cycle of 8086 microprocessor. | II | CO3 |
| 20. Explain briefly about computer arithmetic. | II | CO4 |
| 21. Explain division algorithm with flow chart. | IV | CO4 |
| 22. Explain floating-point arithmetic operations. | III | CO4 |
| 23. What is main memory and Explain about RAM and ROM chip? | 1 | CO5 |
| 24. Explain about associate memory. | 1 | CO5 |

BR-22

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SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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

II B.Tech. I Semester (REGULAR) End Examinations, FEBRUARY - 2024.

(R22ECE2116) COMPUTER ORGANIZATION AND MICROPROCESSOR

05/02/2024

(For CSIT &IT)

Day- 4 (FN)

Duration: 3 Hrs

Maximum 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) Define the term Computer Architecture. | I | CO1 |
| b) Define interrupt. | II | CO1 |
| c) What is Stack & Queue? | I | CO2 |
| d) List out the various addressing techniques. | II | CO2 |
| e) Define Deadlock. | I | CO3 |
| f) List out the types of Interrupts. | II | CO3 |
| g) List down the functions performed by an Input/Output unit. | I | CO4 |
| h) What is priority interrupt ? | II | CO4 |
| i) Give Classification of Memory. | III | CO5 |
| j) Define Pipeline Processing. | I | CO5 |

PART - B

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

(5Qx10M=50M)

UNIT-I

- 2a. Explain about Memory Reference instructions with flowchart. II CO1
- (OR)
- 2b. Explain the phases involved in Instruction cycle with the help of necessary timing diagrams. III CO1

UNIT-II

- 3a. Using the register transfer notations, explain the Memory-Reference instructions with examples. V CO2
- (OR)
- 3b. With a neat flowchart, explain how the control unit determines the instruction after decoding an instruction. III CO2

UNIT-III

- 4a. Draw the functional block diagram of 8086 processor and explain the function of each block. III CO3
- (OR)
- 4b. Explain interrupt cycle of 8086 and demonstrate interrupt programming III CO

UNIT-IV

- 5a. Explain the floating point addition- subtraction unit with a neat diagram. IV CO
- (OR)
- 5b. With a neat schematic sketch, explain about DMA controller and its mode of data transfer. III C

UNIT-V

- 6a. Illustrate the behavior of a pipeline using space-time diagram. V C
- (OR)
- 6b. Implement a simple pipeline unit for floating addition and subtraction. VI

INTRODUCTION TO INTERNET OF THINGS
(R22CS02115)

COs MAPPING WITH POs & PSOs

INTRODUCTION TO IOT (R22CSO2115)

COURSE OUTCOMES (COs):

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

Course Outcomes	Statements
C215.1	Known basic protocols in sensor networks.
C215.2	Program and configure Arduino boards for various designs.
C215.3	Python programming and interfacing for Raspberry Pi.
C215.4	Explore IoT applications in different domains.
C215.5	Know the importance of software defined network(SDN) in IOT
C215.6	Gain the knowledge of how data analytics to be done and used in different domains

COURSE ARTICULATION MATRIX:

Course Outcome	PO 1	PO 2	PO3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C212.1	3	-	-	-	3	-	-	1	-	-	-	-	2	-	-
C212.2	1	3	3	-	-	-	-	1	-	-	-	-	-	2	-
C212.3	2	3	3	1	-	-	-	-	-	-	-	1	-	-	-
C212.4	3	2	2	2	3	-	-	1	-	-	-	-	-	3	-
C212.5	-	2	3	-	1	-	-	1	1	-	-	2	-	-	-
C212.6	1	-	-	3	-	-	-	-	1	-	-	2	2	-	2
C212	2	2.5	2.75	2	2.33	-	-	1	1	-	-	1.66	2	2.5	2

SYLLABUS COPY

BR22 – B.TECH. – INFORMATION TECHNOLOGY

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B B.Tech. - II Year – I Semester

L	T	P	C
2	0	0	2

(R22CSO2115) INTRODUCTION TO IOT

Course Objectives: The objectives of the course are to:

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes: Upon completing this course, the student will be able to:

- Known basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Explore IoT applications in different domains.

UNIT – I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT – III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Case studies.

UNIT - IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

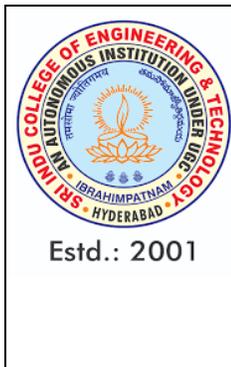
Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. Pethuru Raj and Anupama C. Raman "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press)
2. Terokarvinen, kemo, karvinen and villey valtokari, "Make sensors": 1st edition, maker media, 2014.

REFERENCE BOOKS:

1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Walteneus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

R22

LESSON PLAN

(Regulation: R22)

Department of Computer Science and Information Technology

Sub. Code & title R22CSO2115: INTRODUCTION TO IOT

Year & Sem.: II Year I Sem **Academic Year:** 2024-2025

Faculty Name & Designation Dr. Srinivas Bachu,
Professor, Department of ECE.

Unit / Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
UNIT-I									
I	Introduction					12			
1.1	Introduction to Internet of Things	R1	3	8	Black board	01		CO1,L1	
1.2	Characteristics of IoT	R1	9	15	Black board	01		CO1,L1	
1.3	Physical design of IoT	R1	193	194	PPT	02		CO1,,L2	
1.4	Functional blocks of IoT	R1	195	12	Black board	01		CO1,L2	
1.5	Sensing, Actuation	R1	80	81	Model	02		CO1,L2	
1.6	Basics of Networking,	R1	83	89	Black board	01		CO1,L1	
1.7	Communication Protocols,	R1	148	150	Black board	01		CO1,L2	
1.8	Communication Protocols,	R1	150	150	Black board	01		CO1,L2	
1.9	Sensor Networks	R1	151	158	Black board	02		CO1,L1	
	Review:								
Signature of the HOD / Coordinator									

Unit / Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
UNIT-II									
II	Machine-to-Machine Communications					8			
2.1	Machine-to-Machine Communications,	T1	395	395	Blackboard	01		CO2,L1	
2.2	Machine-to-Machine Communications, Difference between IoT and M2M	T1	395	395	Blackboard	01		CO2,L1	
2.3	Difference between IoT and M2M, Interoperability in IoT,	T1	396	396	Power point Presentation	01		CO2,L2	
2.3	Introduction to Arduino Programming,	R1	397	398	Power point Presentation	01		CO2,L2	
2.4	Introduction to Arduino Programming	R1	620	621	Blackboard	01		CO2,L2	
2.5	Introduction to Arduino Programming	R1	623	624	Blackboard	01		CO2,L3	
2.6	Integration of Sensors and Actuators with Arduino.	R1	625	625	Blackboard	01		CO2,L3	
2.7	Integration of Sensors and Actuators with Arduino.	R1	626	626	Blackboard	01		CO2,L2	
	Review								
Signature of the HOD/Coordinator									

Unit / Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
UNIT-III									
III	Introduction to Python programming					8			
3.1	Introduction to Python programming	T1	226	226	Seminar	01		CO4,L3	
3.2	Introduction to Python programming	T1	227	228	Blackboard	01		CO3,L4	
3.3	Introduction to Raspberry Pi,	T1	230	231	Blackboard	01		CO3,L3	
3.4	Interfacing Raspberry Pi with basic peripherals	R1	341	342	Power point Presentation	01		CO3,L4	
3.5	Interfacing Raspberry Pi with basic peripherals	R1	348	348	Blackboard	01		CO4,L4	
3.6	Implementation of IoT with Raspberry Pi	R1	349	351	Blackboard	01		CO4,L3	
3.7	Implementation of IoT with Raspberry Pi	T1	518	525	Blackboard	01		CO4,L3	
3.8	Case studies on IOT	T1	542	542	Blackboard	01		CO4,L3	
	Review:								
Signature of the HOD/Coordinator									

Unit / Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Actual Date of Handled	Actual Date of Handled	CO/RBT	
			From	To					
UNIT-IV									
IV						7			
4.1	Implementation of IoT with Raspberry Pi	T1	257	263	Blackboard	01		CO4,L2	
4.2	Implementation of IoT with Raspberry Pi	T1	272	273	Blackboard	01		CO4,L2	
4.3	Introduction to Software defined Network	T1	347	347	Blackboard	01		CO3,L4	
4.4	Introduction to Software defined Network	T1	372	372	Blackboard	01		CO3,L4	
4.5	SDN for IoT	T1	376	376	PPT	02		CO3,L2	
4.6	Data Handling and Analytics.	T1	335	335	Blackboard	01		CO3,L4	
	Review:								
Signature of the HOD / Coordinator									

Unit / Item No.	Topic(s)	Book Reference	Page(s)		Teaching Methodology	Actual Date of Handled	Actual Date of Handled	CO/RBT	
			From	To					
UNIT-V									
V	Cloud Computing					9			
5.1	Cloud Computing	T1	557	561	Blackboard	01		CO4,L3	
5.2	Sensor-Cloud	W6	-	-	PPT	01		CO4,L4	
5.3	Smart Cities and Smart Homes (implementations, challenges, applications, advantages, disadvantages)	W7	-	-	PPT	02		CO4,L4	
5.4	Connected Vehicles	W8	-	-	PPT	01		CO4,L6	
5.5	Smart Grid, Industrial IoT	W8	-	-	PPT	02		CO4L6	
5.6	Applications	W8	-	-	PPT	02		CO4,L6	
	Review:								
Signature of the HOD/Coordinator									

LIST OF TEXTBOOKS AND REFERENCES

TEXT BOOKS:

1. Pethuru Raj and Anupama C. Raman "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press)
2. Terokarvinen, Kemo, Karvinen and Villey Valtokari, "Make sensors": 1st edition, Maker Media, 2014.

REFERENCE BOOKS:

1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenege Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

 <p>Estd.: 2001</p>	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY LESSON PLAN (Regulation: R22) Department of Computer Science and Information Technology		R22
	Sub. Code & title	R22CSO2115: INTRODUCTION TO IOT	
	Year & Sem.: II Year I Sem	Academic Year: 2024-2025	
	Faculty Name & Designation	Dr. Srinivas Bachu, Professor, Department of ECE.	

CONTENT BEYOND THE SYLLABUS

S. No	Topics	Proposed Actions	Date	Resource Person / Mode	POs	PSOs
1	Conventional web technology and relationship with IIOT	NPTEL				
2	tomography and layered attacker model	NPTEL				

ASSIGNMENT QUESTIONS FOR Mid-I & Mid-II

ASSIGNMENT – I

Set No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1.	Describe the characteristics of IoT.	I	CO1		
	Illustrate briefly physical design of IoT?	II	CO1		
	With the help of neat diagrams, explain the M2M system architecture?	II	CO1		
	Distinguish between IoT and M2M?	IV	CO1		
	Explain exception handling in Python with example?	II	CO2		
2	Explain in detail about IoT communication APIs?	IV	CO1		
	Outline the basic differences between transducers, sensors, and actuators.	II	CO1		
	Explain the importance of M2M gateway in a Network?	III	CO1		
	Why Interoperability is Important in Context of IoT?	I	CO1		
	Write a python program for switching LED/light based on reading LDR reading.	III	CO2		
3	Explain IoT functional blocks with suitable example?	II	CO1		
	Explain communication models in detail?	II	CO1		
	Mention advantages and Disadvantages of M2M communication system.	II	CO1		
	What are the characteristics of M2M network?	I	CO1		
	What is a module in python? Explain with an example	V	CO2		

4	Explain websocket-based communication APIs in IoT?	II	CO1		
	List out the applications of IoT?	II	CO1		
	Distinguish between syntactic and Semantic interoperability for device interaction?	IV	CO1		
	Explain the concept of Arduino function libraries?	IV	CO1		
	Write a Python program for controlling an LED with a switch with importing GPIO package.	III	CO2		
5	Describe how wireless sensor networks became one of the enabling technologies of IoT.	II	CO1		
	Compare the protocols associated with transport layer of IoT?	II	CO1		
	Write a Arduino 'C' program to sense the available networks using Arduino.	III	CO2		
	Write a Arduino 'C' program to sense a finger when it is placed on board using Arduino?	III	CO2		
	Write detailed notes on MQTT protocol for the IOT in python?	VI	CO2		
6	Define an internet protocol and compare IPV4 and IPV6.	II	CO1		
	What are the protocols associated with network/internet layer of IoT? Explain them in detail.	I	CO1		
	Write a Arduino 'C' program to measure the distance using ultrasonic sensor on Arduino board.	III	CO2		
	Write a Arduino 'C' program and demonstrates the function of blinking an LED using Arduino Uno	II	CO2		
	Explain with neat block diagram about Raspberry Pi board?	II	CO2		
7	Illustrate the generic block diagram of an IoT device and explain it briefly	II	CO1		
	Explain various link layer protocols of IoT?	IV	CO1		
	Write a Arduino 'C' program to alert the temperature using Arduino?	III	CO2		
	Write a Arduino 'C' program with LDR to vary the light intensity of LED using Arduino.	III	CO2		
	Write detailed notes for the below a) Numpy b) MATPLOTLAB c) Sockets & MySQL db.	III	CO2		
8	Write about advantages & disadvantages of IoT?	I	CO1		
	Compare the protocols associated with transport layer of IoT?	II	CO1		
	Write a Arduino 'C' program to detect the vibrations of an object using Arduino.	III	CO2		
	Why Interoperability is Important in Context of IoT?	I	CO1		
	Write detailed notes on raspberry pi importance in IOT?	VI	CO2		
9	Explain in detail about IoT communication APIs?	IV	CO1		
	Outline the basic differences between transducers, sensors, and actuators.	II	CO1		

	Explain the importance of M2M gateway in a Network?	III	CO1		
	Why Interoperability is Important in Context of IoT?	I	CO1		
	Write a python program for switching LED/light based on reading LDR reading.	III	CO2		
10	Explain IoT functional blocks with suitable example?	II	CO1		
	Explain communication models in detail?	II	CO1		
	Mention advantages and Disadvantages of M2M communication system.	II	CO1		
	What are the characteristics of M2M network?	I	CO1		
	What is a module in python? Explain with an example	V	CO2		
11	Explain websocket-based communication APIs in IoT?	II	CO1		
	List out the applications of IoT?	II	CO1		
	Distinguish between syntactic and Semantic interoperability for device interaction?	IV	CO1		
	Explain the concept of Arduino function libraries?	IV	CO1		
	Write a Python program for controlling an LED with a switch with importing GPIO package.	III	CO2		
12	Describe how wireless sensor networks became one of the enabling technologies of IoT.	II	CO1		
	Compare the protocols associated with transport layer of IoT?	II	CO1		
	Write a Arduino 'C' program to sense the available networks using Arduino.	III	CO2		
	Write a Arduino 'C' program to sense a finger when it is placed on board using Arduino?	III	CO2		
	Write detailed notes on MQTT protocol for the IOT in python?	VI	CO2		
13	Define an internet protocol and compare IPV4 and IPV6.	II	CO1		
	What are the protocols associated with network/internet layer of IoT? Explain them in detail.	I	CO1		
	Write a Arduino 'C' program to measure the distance using ultrasonic sensor on Arduino board.	III	CO2		
	Write a Arduino 'C' program and demonstrates the function of blinking an LED using Arduino Uno.	II	CO2		
	Explain with neat block diagram about Raspberry Pi board?	II	CO2		

ASSIGNMENT – II

Set No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1.	What is the NOOBS software? What are gpio pins used in raspberry pi boards.	I	CO2		

	Explain about Data Acquiring and Organizing in IoT/M2M,	II	CO3		
	With neat diagram, explain architecture of sensor cloud platform?	II	CO3		
	Explain the concept of Industry 4.0	II	CO4		
	Draw the block diagram of NIST Visual Model of Cloud Computing and explain?	II	CO4		
2	Explain the concept of File Read Write Operations?	II	CO2		
	Explain service level agreement and its merits in cloud computing?	II	CO3		
	Explain in detail the need and types of Data Analytics for IoT?	II	CO3		
	Explain the evolution of cloud computing	II	CO4		
	List out the Components of Cloud Computing and explain it?	IV	CO4		
3	What is raspberry pi and how does the raspberry pi works?	I	CO2		
	What are the challenges faced by IoT Data Analytics and explain it?.	IV	CO3		
	Explain the differences between data in motion and data in rest, mentioning examples to each one?	II	CO3		
	Explain the smart home automation system in an IoT?	II	CO4		
	List out the various applications of IoT.	II	CO4		
4	What are the different components of a raspberry pi boards? Can raspberry pi be used as a server?	III	CO2		
	What is the use of SDN and NFV for IOT?	I	CO3		
	Draw the structure of software defined networking for IoT & Explain it?	III	CO3		
	Explain the Cloud Computing - Services?	II	CO4		
	Describe the implementation of IoT technology into distributed energy systems to optimize the efficiency of energy infrastructure and reduce wastage in the following categories: (i) Smart grids (ii) Renewable energy systems	III	CO4		
5	What is the language used by raspberry pi? How raspberry pi different from Arduino?	VI	CO2		
	Describe the Information Model specification in IoT system Design.	II	CO3		
	Explain Raspberry Pi GPIO headers with neat diagram.	II	CO3		
	Distinguish between WSN and Sensor-Cloud.	IV	CO4		
	Compare the of Different Service Models of cloud-computing?	II	CO4		
6	What are the generations of raspberry pi available?	III	CO2		
	List out the advantages and disadvantages of raspberry pi ?	I	CO3		
	Explain hardware and software implementation in raspberry pi?	II	CO3		
	Explain how IoT technology can used in the following application areas:	II	CO4		

	(i) Structural health monitoring Surveillance	(ii)			
	Define how the IoT technology can be implemented in smart lightening and intrusion detection systems.	II	CO4		
7	How is Raspberry Pi different from a desktop Computer?	I	CO2		
	Explain below about raspberry pi i. Purpose of selecting raspberry pi ii. Interfacing modules of raspberry pi	IV	CO3		
	Explain difference between SDN and tradition networking?	II	CO3		
	Explain sensor-cloud: Architecture & view, with neat diagram?	II	CO4		
	Explain how the IoT technology is impacting the healthcare sector and changing our everyday lifestyle with the following examples: Health & Fitness monitoring	II	CO4		
8	What is raspberry pi and how does the raspberry pi works?	I	CO2		
	Explain detailed notes on how data handling and analytics working in IOT	II	CO3		
	Explain Raspberry Pi GPIO headers with neat diagram.	II	CO3		
	Explain how the IoT technology is impacting the healthcare sector and changing our everyday lifestyle with the following examples: Wearable electronics	IV	CO4		
	List out the various applications of IoT.	II	CO4		
9	What is the NOOBS software? What are gpio pins used in raspberry pi boards.	I	CO2		
	Explain about Data Acquiring and Organizing in IoT/M2M,	II	CO3		
	With neat diagram, explain architecture of sensor clod platform?	II	CO3		
	Explain the concept of Industry 4.0	II	CO4		
	Draw the block diagram of NIST Visual Model of Cloud Computing and explain?	II	CO4		
10	Explain the concept of File Read Write Operations?	II	CO2		
	Explain service level agreement and its merits in cloud computing?	II	CO3		
	Explain in detail the need and types of Data Analytics for IoT?	II	CO3		
	Explain the evolution of cloud computing	II	CO4		
	List out the Components of Cloud Computing and explain it?	IV	CO4		
11	What is raspberry pi and how does the raspberry pi works?	I	CO2		
	What are the challenges faced by IoT Data Analytics and explain it?.	IV	CO3		
	Explain the differences between data in motion and data in rest, mentioning examples to each one?	II	CO3		
	Explain the smart home automation system in an IoT?	II	CO4		
	List out the various applications of IoT.	II	CO4		

12	What are the different components of a raspberry pi boards? Can raspberry pi be used as a server?	III	CO2		
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 <p>Estd.: 2001</p>	SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY		R22
	<u>QUESTION BANK</u> (Regulation: R22) Department of Computer Science and Information Technology		
	Sub. Code & title	R22CSO2115: INTRODUCTION TO IOT	
	Year & Sem.: II Year I Sem	Academic Year: 2024-2025	
Faculty Name & Designation		Dr. Srinivas Bachu, Professor, Department of ECE.	

QUESTION BANK

UNIT-I

UNIT-I			
MultipleChoiceQuestions		BT Level	Course Outcome
#1C-1	What does IoT stand for? A) Internet of Technology B) Internet of Things C) Internet of Telecommunications D) Internet of Transactions	II	CO1
#1C-2	What is the primary purpose of IOT technology? A) To make physical objects more expensive B) To connect and exchange data between devices C) To reduce the number of interconnected devices D) To create isolated and inefficient systems	I	CO1
#1C-3	What is the primary role of control units in IoT devices? A) Collecting sensor data B) Providing power to sensors C) Processing data and logical operations D) Storing data on cloud server	III	CO1
#1C-4	Why is cloud computing important in IoT? A) To store and process massive amounts of data B) To reduce the number of sensors C) To save battery power D) To improve sensor accuracy	I	CO1
#1C-5	What type of sensor is typically used for measuring distances and detecting obstacles in front of a device or vehicle? A) IR Sensor B) Image Sensor C) RF Sensor D) Ultrasonic Distance Sensor	III	CO1
#1C-6	Which of the following IoT enablers uses radio waves to electronically track tags attached to physical objects? A) Nanotechnology B) Sensors C) RFIDs D) Smart networks	II	CO1

#1C-7	<p>What is the primary role of actuator devices in IoT?</p> <p>A) Performing actions based on sensor triggers B) Collecting data C) Transmitting data D) Analyzing data</p>	I	CO1
#1C-8	<p>What is one of the advantages of IOT ?</p> <p>A) Decreased control of devices and systems B) Reduced cost savings C) Increased maintenance requirements D) Improved efficiency and automation of tasks</p>	V	CO1
#1C-9	<p>Which of the following is NOT a characteristic of IOT?</p> <p>A) Massively scalable and efficient B) IP-based addressing suitable for the long term C) Devices typically consume less power D) Intermittent connectivity with periodic power-saving modes</p>	I	CO1
#1C-10	<p>What is the primary purpose of IOT application related to "Smart door lock protection system"?</p> <p>A) Monitoring radiation levels B) Monitoring water flow C) Enhancing home security D) Detecting earthquakes</p>	IV	CO1
#1C-11	<p>which block is responsible for filtering out noise and irrelevant data, converting the data into an easily studied format, and recognizing patterns and anomalies in the data.</p> <p>A) Connectivity block B) sensor/actuator C) Data processing block D) application block</p>	V	CO1
#1C-12	<p>which communication protocol is a form of wireless technology used for device communication and to make personal area networks(PANs).</p> <p>A) Bluetooth B) Bluetooth low energy C) Zig-bee D) Ethernet</p>	IV	CO1
#1C-13	<p>. Which system is a technology that supports the identification of objects via radio waves</p> <p>A) RFID B) RFIID C) RFDI D) RDFI</p>	VI	CO1
#1C-14	<p>Which was the first to introduce LPWAN technologies in the development of IoT projects</p> <p>A) Ethernet B) Sigfox C) Z-wave D) RFID</p>	I	CO1
#1C-15	<p>Which of the following is not a component of WSN</p> <p>A) sensors B) Radio nodes C) Evolution s/w D) Reliability</p>	IV	CO1

#Fill in the Blank Questions				
#1F-1	_____ is the combination of computer h/w and s/w designed for specific function	I	CO1	
#1F-2	_____ of small computer on a single integrated circuit containing micro-processor or processing core memory & programmable i/o device peripherals	VI	CO1	
#1F-3	_____ is the phenomenon of communication between 2-n/w's or communication between two or more IOT-devices of same or diff networks	II	CO1	
#1F-4	_____ is the major challenge in IOT application	III	CO1	
#1F-5	An interface like _____ & _____ devices is used to record audio & video in a IOT physical design-system	V	CO1	
#1F-6	_____ is a protocol that present an application layer for transmitting media documents	VI	CO1	
#1F-7	_____ enables 2-way communication between a client & host that can be run on an untrusted code in a controlled environment	I	CO1	
#1F-8	_____ is a part of an interenet protocol called the connectionless	II	CO1	
#1F-9	abbreviation of MQTT _____	I	CO1	
#1F-10	Abbreviation of COAP _____	IV	CO1	
#1F-11	The _____ serves as the data entry point in an IOT-System	I	CO1	
#1F-12	The obtained data is examined & processed in the _____ block	II	CO1	
#1F-13	Write abbreviation of LPWAN _____	I	CO1	
#1F-14	_____ allows us to identify objects and extract information	I	CO1	
#1F-15	Zigbee consist of _____ nodes	II	CO1	
#Match the following Questions				
#1M-1	Match the following according to functionality of WSN components:		V	CO1
	A. radio waves .	1. It receives the data which is sent by the Radio nodes		
	B. Sensors	2. used for processing, analysis, storage, and mining of the data		
	C. Evolution s/w	3.It is used to receive the data produced by the Sensors		
	D.WLAN access point	4. Are converted into electrical signals.		
#1M-2	Match The Following Questions according to their functionality A)Sensors/actuators block 1. creating and managing communication channels amongst IoT system devices. B)Connectivity block 2. handling device configuration, firmware updates, and system monitoring C) Security block 3. authentication and authorization D) Management block 4. collect data from their surroundings		IV	CO1
#1M-3	Match The Following Questions A) MQTT 1.Constrained Application Protocol B) HTTP 2.Advanced Message Queuing Protocol		IV	CO1

	C) COAP	3.Message Queuing Telemetry Transport		
	D) AMQP	4.Hypertext Transfer Protocol		
#1M-4	Match The Following Questions			
	A) Wearable devices	1.GPS tracking, remote diagnostics,		
	B) Smart home devices	2. logistics tracking systems,		
	C) Connected vehicles	3. fitness trackers, health monitoring devices.	II	CO1
	D) Smart appliances	4. as lighting, security systems, thermostats		
#1M-5	Match The Following Questions according to physical design of IOT			
	A) Connectivity	1.GPU		
	B) Memory interfaces	2.RCA VIDEO	I	CO1
	C) Audio/video	3.USB HOST		
	D) Graphics	4.NAND/NOR		
# 5 MARKS QUESTIONS				
#1D-1	Describe the characteristics of IoT.		I	CO1
#1D-2	Illustrate briefly physical design of IoT?		II	CO1
#1D-3	Explain in detail about IoT communication APIs?		IV	CO1
#1D-4	Outline the basic differences between transducers, sensors, and actuators.		II	CO1
#1D-5	Explain IoT functional blocks with suitable example?		II	CO1
#1D-6	Explain communication models in detail?		II	CO1
#1D-7	Explain websocket-based communication APIs in IoT?		II	CO1
#1D-8	List out the applications of IoT?		II	CO1
#1D-9	Describe how wireless sensor networks became one of the enabling technologies of IoT.		II	CO1
#1D-10	Compare the protocols associated with transport layer of IoT?		II	CO1
#1D-11	Define an internet protocol and compare IPV4 and IPV6.		II	CO1
#1D-12	What are the protocols associated with network/internet layer of IoT? Explain them in detail.		I	CO1
#1D-13	Illustrate the generic block diagram of an IoT device and explain it briefly		II	CO1
#1D-14	Explain various link layer protocols of IoT?		IV	CO1
#1D-15	Write about advantages & disadvantages of IoT?		I	CO1

#UNIT-II

#MultipleChoiceQuestions		BT Level	Course Outcome
#2C-1	In Arduino UNO board function of AREF () A) Reference voltage to the inputs of an analog B) Dumping of code C) Communication purpose	I	CO2
#2C-2.	In Arduino UNO board usage of TWI () A) Communication B) Power supply C) Resetting	I	CO2
#2C-3.	What is the operating voltage of the Arduino() A) 3.3v B) 7v C) 5v	I	CO2
#2C-4.	Input & Output voltage of Arduino () A) 7v-12v B) 5v-10v C) 6v-20	I	CO2
#2C-5.	What enables communication between heterogeneous devices or system in order to achieve a common goal() A) scalability B) interoperability C) connectivity	III	CO2
#2C-6.	What systems face a no. of security issues from unauthorized access to wireless Intrusion to device hacking () A) PWM B) IOT C) M2M	I	CO2
#2C-7.	What is the main purpose of M2M () A) Security B) Implementing Software C) Monitor & control	I	CO2
#2C-8.	In M2M how data is organized () A) Unstructured data B) Structured data C) Random data	IV	CO2
#2C-9.	In IOT how communication can be done follow () A) Back-way B) Front way C) Back-forth way	I	CO2

#2C-10.	How M2M Systems use communication B/w Machines () A) Point-multiple B) Random C) Point-point	IV	CO2
#2C-11.	M2M is mostly _____ a) Hardware centric b) Software centric c) Both d) None	I	CO2
#2C-12.	The relation between IoT and M2M is _____ a) IoT is part of M2M b) M2M is the part of IoT c) Both are same d) None	I I I	CO2
#2C-13.	What is Arduino? a) Programming language b) Image editing software c) Open-source electronics platform d) Text editor	I	CO2
#2C-14.	What language is a typical Arduino code based on? a) Assembly Code b) Python c) Java d) C/C++	I	CO2
#2C-15.	Arduino IDE consists of 2 functions. What are they? a) Loop() and build() and setup() b) Build() and loop() c) Setup() and build() d) Setup() and loop()	III	CO2
#Filling The Blank Questions			
#2F-1	_____ technology was first adopted in manufacturing and industrial settings	II	CO2
#2F-2	In _____ M2M devices can enable the real time monitoring of patients' vital statistics, dispensing medicine when required or tracking healthcare assets.	III	CO2
#2F-3	_____ requirement in M2M system should be able to continue to function efficiently as more connected objects are added.	I	CO2
#2F-4	M2M systems use _____ communications between machines.	I	CO2
#2F-5	_____ systems face a number of security issues, from unauthorized access to wireless intrusion to device hacking.	VI	CO2
#2F-6	_____ M2M systems must be able to control network access and messaging schedules and should be conscious of M2M applications.	V	CO2

#2F-7	_____ a messaging protocol	IV	CO2
#2F-8	_____ is the ability of two or more devices, systems, platforms or networks to work in conjunction.	II	CO2
#2F-9	Full form of IDE _____	II	CO2
#2F-10	Most of the Arduino boards come with _____ Microcontroller	II	CO2
#2F-11	The memory of an ATmega328 microcontroller _____ memory is utilized for the Bootloader.		CO2
#2F-12	The serial pins of an Arduino board are _____	IV	CO2
#2F-13	The PWM pins of an Arduino are _____	V	CO2
#2F-14	An Arduino board is inbuilt with a LED using digital _____	I	CO2
#2F-15	_____ are those which require an external excitation signal or power signal.	I	CO2
	#Match The Following Questions		
#2M-1	Match the following according to their use use: 1) IR A) Presence of an object 2) Photo diode B) Temperature 3) Proximity sensor C) IR-receiver 4) Thermistor D) Emit infrared rays	I	CO2
#2M-2	Match the following according to M2M-requirement 1) Scalability A) Recording of important event 2) Anonymity B) Unicast, broad cast 3) Logging C) Function-efficiently 4) Delivery Methods D) Hide the identity	II	CO2
#2M-3	Match the following according to their functionality 1) MQTT A) Wireless mesh protocol 2) Google thread B) Discovery protocol 3) OMA C) Messaging protocol 4) Hyper-cat D) Device management protocol	III	CO2
#2M-4	Match the following according to the features of Arduino: 1) Analog pins a) 1KB 2) PWM b) 3.3v-50mA 3) DC c) 6-pins 4) EEPROM d) 6-pins	III	CO2
#2M-5	Match the following according to Arduino board pin functionality: 1) Pin-12 a) CLK pulse synchronizes 2) RST-Pin b) Transmit the data to the devices 3) Pin-11 c) Resetting the micro-controller 4) Pin-13 d) Serial CLK	III	CO2
#5 MARKS QUESTIONS			
#2D-1	With the help of neat diagrams, explain the M2M system architecture?	II	CO1
#2D-2	Distinguish between IOT and M2M?	IV	CO1
#2D-3	Explain the importance of M2M gateway in a Network?	III	CO1

#2D-4	Why Interoperability is Important in Context of IoT?	I	CO1
#2D-5	Mention advantages and Disadvantages of M2M communication system.	II	CO1
#2D-6	What are the characteristics of M2M network?	I	CO1
#2D-7	Distinguish between syntactic and Semantic interoperability for device interaction?	IV	CO1
#2D-8	Explain the concept of Arduino function libraries?	IV	CO1
#2D-9	Write a Arduino 'C' program to sense the available networks using Arduino.	III	CO2
#2D-10	Write a Arduino 'C' program to sense a finger when it is placed on board using Arduino?	III	CO2
#2D-11	Write a Arduino 'C' program to alert the temperature using Arduino?	III	CO2
#2D-12	Write a Arduino 'C' program with LDR to vary the light intensity of LED using Arduino.	III	CO2
#2D-13	Write a Arduino 'C' program to measure the distance using ultrasonic sensor on Arduino board.	III	CO2
#2D-14	Write a Arduino 'C' program and demonstrates the function of blinking an LED using Arduino Uno	II	CO2
#2D-15	Write a Arduino 'C' program to detect the vibrations of an object using Arduino.	III	CO2

#UNIT-III				
# Multiple Choice Questions			BT Level	Course Outcome
#3C-1	How much memory does raspberry pi model B+ have? A) 512 mb B) 612 mb C) 712 mb D) 812 mb	I	CO3	
#3C-2	The clock speed of raspberry pi model B+ is around _____ a)100MHz b) 300MHz c) 500MHz d) 700MHz	I	CO3	
#3C-3	In which one of the following is used for multitasking? a)Raspberry pi model b) Arduino Uno c) Both a and b d) none of the above	VI	CO3	
#3C-4	The input voltage for raspberry pi model B is around _____ a)5v b)10v c) 12v d)15v	I	CO3	

#3C-5	<p>How many ports does raspberry pi zero WH contain?</p> <p>a)One b)two c)three d)four</p>	II	CO3
#3C-6	<p>Is Python code compiled or interpreted?</p> <p>a) Python code is both compiled and interpreted b) Python code is neither compiled nor interpreted c) Python code is only compiled d) Python code is only interpreted</p>	II	CO3
#3C-7	<p>All keywords in Python are in _____</p> <p>a) Capitalized b) lower case c) UPPER CASE d) None of the mentioned</p>	I	CO3
#3C-8	<p>Which of the following is used to define a block of code in Python language?</p> <p>a) Indentation b) Key c) Brackets d) All of the mentioned</p>	I	CO3
#3C-9	<p>. Which of the following functions can help us to find the version of python that we are currently working on?</p> <p>a) sys.version(1) b) sys.version(0) c) sys.version() d) sys.version</p>	I	CO3
#3C-10	<p>Python supports the creation of anonymous functions at runtime, using a construct called _____</p> <p>a) pi b) anonymous c) lambda d) none of the mentioned</p>	III	CO3
#3C-11	<p>Does RPi have an internal memory?</p> <p>a) True b) False</p>	I	CO3
#3C-12	<p>Does Raspberry Pi need external hardware?</p> <p>a) True b) False</p>		
#3C-13	<p>What do we use to connect TV to RPi?</p> <p>a) Male HDMI b) Female HDMI c) Male HDMI and Adapter d) Female HDMI and Adapter</p>	I	CO3
#3C-14	<p>How power supply is done to RPi?</p> <p>a) USB connection b) Internal battery c) Charger d) Adapter</p>	I	CO3
#3C-15	<p>Which instruction set architecture is used in Raspberry Pi?</p> <p>a) X86 b) MSP c) AVR d) ARM</p>	I	CO3

#Fill in the Blank Questions			
#3F-1	_____ functions is a built-in function in python?	I	CO3
#3F-2	_____ is a scientific computing package that helps to create datasets to test with the time series data in IoT	II	CO3
#3F-3	_____ that facilitate networking in IoT devices include TCP/IP and UDP, which are compatible to work with Python packages.	I	CO3
#3F-4	_____ visualizes the most paramount operations by giving a variety of graphs to represent the data.	III	CO3
#3F-5	_____ is used for multitasking	I	CO3
#3F-6	The input voltage for raspberry pi model B is around _____	VI	CO3
#3F-7	How much RAM does raspberry pi 4 model B have_____	I	CO3
#3F-8	The speed of raspberry pi 400 is around _____	III	CO3
#3F-9	_____many GPIO pins does raspberry pi model A have?	I	CO3
#3F-10	_____one is used to connect the television to the raspberry pi?	II	CO3
#3F-11	The input voltage for raspberry pi model B is around _____	I	CO3
#3F-12	Raspberry pi _____model has an Ethernet port	II	CO3
#3F-13	Advantages of raspberry pi_____	I	CO3
#3F-14	The speed of raspberry pi 4 model B is_____	II	CO3
#3F-15	The standard form of MISO pin is _____	II	CO3
#Match The Following Questions			
#3M-1	Match the following 1) Empty set in python (a)read sensor bulk-data from the db 2) Raspberry pi (b)GP103 3) Numpy (c)It keeps the cost low & want to save on space 4)EEPROM (d)set()	I	CO3
#3M -2	Match the following: 1)Raspberry pi (a)2012-2014 2) Raspberry pi 1 (b)2012 3) Raspberry pi 2 (c)2016 (4) Raspberry pi 3 (d)2015	I	CO3
#3M -3	Match the following on raspberry pi: 1) GND-pins (a) Serial protocol for a 2-wire interface 2) UART (b) Short-distance communication 3) I2C (c) 8-pins 4) SPI (d) TXD,RXD	II	CO3

#3M -4	Match the following on raspberry pi4 peripherals 1) USB(3.0) (a) allows to pass the power to the device through i/n 2) Display (b) use them without any interface 3) POE-header (c) support given users to transfer data quickly 4) Camera (d) used to communicate with external compatible	I	CO3
#3M -5	Match the following on raspberry pi4 connections 1) 32 a) There is a limit of ____ simultaneously connected devices on Pi 4 2) 30 b) one address is reserved by the _____ USB2. 0 hub 3) 1 c) the hardware supports _____ device address slots 4) internal devices d) _____ address is kept free for unconfigured	I	CO3

S. No	# 5 Mark Questions	BTL	Course Outcome
#3D-1	Explain with neat block diagram about Raspberry Pi board?	II	CO2
#3D-2	Write detailed notes for the below a) Numpy b) MATPLOTLAB c) Sockets & MySQL db.	III	CO2
#3D-3	Write detailed notes on raspberry pi importance in IoT?	VI	CO2
#3D-4	What is the NOOBS software? What are gpio pins used in raspberry pi boards.	I	CO2
#3D-5	Explain the concept of File Read Write Operations?	II	CO2
#3D-6	What is raspberry pi and how does the raspberry pi works?	I	CO2
#3D-7	What are the different components of a raspberry pi boards? Can raspberry pi be used as a server?	III	CO2
#3D-8	What is the language used by raspberry pi? How raspberry pi different from Arduino?	VI	CO2
#3D-9	What are the generations of raspberry pi available?	III	CO2
#3D-10	Write a Python program for controlling an LED with a switch with importing GPIO package.	III	CO2
#3D-11	Write detailed notes on MQTT protocol for the IOT in python?	VI	CO2
#3D-12	How is Raspberry Pi different from a desktop Computer?	I	CO2
#3D-13	Explain exception handling in Python with example?	II	CO2
#3D-14	Write a python program for switching LED/light based on reading LDR reading.	III	CO2
#3D-15	What is a module in python? Explain with an example	V	CO2

#UNIT-IV

#Multiple Choice Questions		BT Level	Course Outcome
#4C-1.	1) What are the major concern in SDN? a) securityissues b) softwareproblems c) cloudsensor d) datamanagement	I	CO4
#4C-2.	2) To improve lower latency in SDN_____to prioritise latency sensitive traffic a) qualityofservices(QOS) b) Bluetoothlowenergy c) WiFi Router	I	CO1
#4C-3.	3) In SDN goal of the goal concept is to reduce network maintenance & administration while increasing. a) intelligenceandflexibility b) Scalability c) efficiency d) costsaving	I	CO4
#4C-4.	4) INSDNviaAPI,thefunctionsinremotedevicelikeswitchesareinvolvedusingconventionalmethods a) SNMP(or)CLI b) Dataplane c) CONTROL PLANE d) SDN	III	CO4
#4C-5	5) _____isacombinationoftraditionalnetworkingwithsoftwaredefinednetworking a) SDNVIAAPI b) SDNViaHyperVcorbasedoverlaynetwork c) penSDN d) HybridSDN	I	CO4
#4C-6	6) What are the three layers that make upSDN? a) (1)networkinglater(2)physicallayer(3)transportlayer b) (1)Appllationlayer(2)controllayer(3)physicallayer c)(1)Applicationlayer(2)Transportlayer(3)networkinglayerd) d)(1)transportlayer(2)Networkinglayer(3)Datalinklayer	V	CO4
#4C-7	7) What RBAC a) Role based access control protocol b) Role based accept configuration protocol c) Real based access control protocol d) Real based accept central protocol	II	CO4
#4C-8	8) Which pin is a serial interface pin on raspberry pi 3 model B board? a. GPIO9 b. GPII9 c. GPII8 d. All of the above	I	CO4

#4C-9	9) Where raspberry pi can use? a. Home automation and security systems b. Media center c. HD surveillance camera d. All of the above	V	CO4
#4C-10	10) Which one of the following is a microcontroller? a. Arduino b. Raspberry pi c. Both a and b d. None of the above	II	CO4
#4C-11	11) Which one of the following is a microcomputer? a. Arduino b. Raspberry pi c. Both a and b d. None of the above	I	CO4
#4C-12	12) Which one of the following uses a micro SD card as an operating system? a. Arduino b. Raspberry pi c. Both a and b d. None of the above	V	CO4
#4C-13	13) Which one has USB, camera, display, audio, and video connections? a. Arduino b. Raspberry pi c. Both a and b d. None of the above	II	CO4
#4C-14	14) The raspberry pi has _____ output and input ports a. Digital I/O b. Analog inputs c. Analog outputs d. All of the above	II	CO4
#4C-15	15) In how many volts does raspberry pi runs? a. 1V b. 2V c. 5V d. 12V	II	CO4
FILL IN THE BLANKS			
#4F-1	SDNenablesthecontrolandmanagementofthenetworkusing _____	I	CO4
#4F-2	1) DNnetworkbehaviouroftheentirenetworkandit'sdevicesareprogrammedina _____ mannerthroughsoftwareapplicationusingopenAPIS	II	CO4
#4F-3	_____	III	CO4
#4F-4	Dataplanefunction _____	IV	CO4
#4F-5	controlpanelfunction _____	I	CO4
#4F-6	5) _____ SDNallowsyoutoprogr amatically _____ flowoftraffic	II	CO4

#4F-7	6) SDN provides very better for sales, services and internal communication	II	CO4
#4F-8	SDN provides better speed than other networking types by applying an _____	II	CO4
#4F-9	SDN controller collects network information from _____ and send this information	V	CO4
#4F-10.	_____ consists of physical switches which form the data planes and carried out the actual movement of data packets	I	CO4
#4F-11	Does Raspberry Pi need external hardware? _____ (T/F)	II	CO4
#4F-12	RPi _____ an internal memory?	II	CO4
#4F-13	_____ command used for easy using of GNU screen?	V	CO4
#4F-14	_____ USB ports are present in Raspberry Pi 3?	I	CO4
#4F-15	Does micro SD card present in all modules? _____ (T/F)	II	CO4

#MatchTheFollowing Questions

#4M-1	MatchTheFollowing 1) Ether fabric a) Openflow complaint 2) Overlay approach b) Open N/W foundation 3) ONF c) Optimize performance 4)Orchetration d) Central configuration of entire data centres	III	CO4
#4M-2	MatchTheFollowing 1) SDN stand for? a) Network Virtualization 2) Term describes the process b) between SDN controller and of creating multiple virtual networks applications 3) primary purpose of a Network c) Software Defined Network Controller in an SDN 4) What is the northbound interface d) communication between the control and data planes	III	CO4
#4M-3	MatchTheFollowing 1. protocol used in SDN? A. Control layer 2. key element of SDN B. OpenFlow 3. challenge of SDN C. Python 4. language is used for SDN D. Scalability	III	CO4
#4M-4	MatchTheFollowing 1. Raspberry Pi contains _____ A. MicroPython and C 2. Language is used in Raspberry Pi B. ARM CPU 3. invention of the Raspberry Pi C. Single board computer 4. Raspberry Pi a _____ D. Eben Upton	III	CO4

#4M-5	Match the following on raspberry pi: 1) GND-pins (a) Serial protocol for a 2-wire interface 2) UART (b) Short-distance communication 3) I2C (c) 8-pins 4) SPI (d) TXD,RXD	II	CO3
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5-MARKS QUESTIONS

#4D-1	Explain about Data Acquiring and Organizing in IoT/M2M,	II	CO3
#4D-2	With neat diagram, explain architecture of sensor cloud platform?	II	CO3
#4D-3	Explain service level agreement and its merits in cloud computing?	II	CO3
#4D-4	Explain in detail the need and types of Data Analytics for IoT?	II	CO3
#4D-5	What are the challenges faced by IoT Data Analytics and explain it?.	IV	CO3
#4D-6	Explain the differences between data in motion and data in rest, mentioning examples to each one?	II	CO3
#4D-7	What is the use of SDN and NFV for IOT?	I	CO3
#4D-8	Draw the structure of software defined networking for IoT & Explain it?	III	CO3
#4D-9	Describe the Information Model specification in IoT system Design.	II	CO3
#4D-10	Explain Raspberry Pi GPIO headers with neat diagram.	II	CO3
#4D-11	List out the advantages and disadvantages of raspberry pi ?	I	CO3
#4D-12	Explain hardware and software implementation in raspberry pi?	II	CO3
#4D-13	Explain below about raspberry pi i. Purpose of selecting raspberry pi ii. Interfacing modules of raspberry pi	IV	CO3
#4D-14	Explain difference between SDN and tradition networking?	II	CO3
#4D-15	Explain detailed notes on how data handling and analytics working in IOT	II	CO3

#UNIT-V

# Multiple choice questions		BT Level	Course Outcome
#5C-1.	Which of the following is not a type of cloud server. a.merged cloud servers. b.dedicated cloud servers. c.private cloud servers. d.public cloud servers.	I	CO4
#5C-2.	The IoT is defines as everyday objects thwt are inter connected over internet that _____and_____ a.send and recieve b.transmit and forward c.message and response d.forward and retrieve	I	CO4

#5C-3.	industrial iot involves in the use of _____ a.sensor b.cloud c.voice over d.all of the above	II	CO4
#5C-4.	application firewall is an example of _____ a.hardware b.software c.bothaand b d.all the above	IV	CO4
#5C-5	_____ involves the use of sensor that detect garbage bins to notify city authorities a.smart parking b.smart watering c.smart waste management d.smart parking	IV	CO4
#5C-6	iot data is more secure and private because of a.cloud computing b.sensors c.smart cities d.all	IV	CO4
#5C-7	. _____ have become the backbone of any organization. a.voice enable device b.facial recognition c.biometric access d.motion detection	IV	CO4
#5C-8	temperature sensor is a type of _____ sensor a.vector b.scalar c.inter d.none of the above	IV	CO4
#5C-9	which device can be considered a smart device? a.printer b.alex c.digital camera d.speaker	III	CO4
#5C-10	which of the following is not a type of cloud server. a.merged cloud servers. b.dedicated cloud servers. c.private cloud servers.	I	CO4
#5C-11	Which of the following is the way in which an IoT device is associated with data? a. Internet b. Cloud c. Automata d. Network	II	CO4
#5C-12	An IoT network is a collection of _____ devices. a. Signal b. Machine to Machine	IV	CO4

	<ul style="list-style-type: none"> c. Interconnected d. Network to Network 		
#5C-13	<p>Which of the following is not an application of IoT?</p> <ul style="list-style-type: none"> a. Wearables b. Smart Grid c. Arduino d. Smart City 	IV	CO4
#5C-14	<p>What is the standard form of RFID?</p> <ul style="list-style-type: none"> a. Radio Frequency Identification b. Radio Waves Frequency Identification c. Radio Frequency InterDependent d. Radio Wave Frequency Independent 	IV	CO4
#5C-15	<p>Which of the following IoT networks has a very short range?</p> <ul style="list-style-type: none"> a. Short Network b. LPWAN c. SigFox d. Short-range Wireless Network 	IV	CO4
	# Fill in the blanks		
#5F-1	_____is an object which transfer and receive the data across network and can have ip address	III	CO4
#5F-2	in order for better control and manage traffic in cities we use _____	II	CO4
#5F-3	integrated version of wireless sensor networks and cloud computing is as _____	V	CO4
#5F-4	strain guage converts strain to _____	IV	CO4
#5F-5	_____can accept voice commands and can be controlled through smart phones.	IV	CO4
#5F-6	IOT enables _____of various devices within a smart home.	II	CO4
#5F-7	_____can easily connect with each other using IOTapis.	III	CO4
#5F-8	_____ use devices that are internet and AI enabled	IV	CO4
#5F-9	____technology used in alexa or google assistants.	II	CO4
#5F-10	solenoid is a type of _____	III	CO4
#5F-11	IOT stands for _____	II	CO4
#5F-12	A _____ . tends to convert physical attribute to an electrical signal.	III	CO4
#5F-13	A _____ tends to convert electrical signal to physical action .	IV	CO4

	wastage in the following categories: (i) Smart grids (ii) Renewable energy systems		
#5D-9	Distinguish between WSN and Sensor-Cloud.	IV	CO4
#5D-10	Compare the of Different Service Models of clod-computing?	II	CO4
#5D-11	Explain how IoT technology can used in the following application areas: (i) Structural health monitoring (ii) Surveillance	II	CO4
#5D-12	Define how the IoT technology can be implemented in smart lightening and intrusion detection systems.	II	CO4
#5D-13	Explain sensor-cloud: Architecture & view, with neat diagram?	II	CO4
#5D-14	Explain how the IoT technology is impacting the healthcare sector and changing our everyday lifestyle with the following examples: Health & Fitness monitoring	II	CO4
#5D-15	Explain how the IoT technology is impacting the healthcare sector and changing our everyday lifestyle with the following examples: Wearable electronics	IV	CO4

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**
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PART-A

1. a) Define 802.16- WiMax. [2M]
b) Explain Network Service Capability Layer (NSCL). [2M]
c) What are connected devices? [2M]
d) What are the components of IoT? [3M]
e) What is the significance of analyzing the data generated by IoT application? [3M]
f) Write about Nimbis. [2M]

PART-B

2. a) How might wireless communications have an effect on the development and implementation of the internet of things (IoT)? Explain. [7M]
b) What are the major Privacy and Security Issues in case of Internet Of Things (IoT)? [7M]
3. a) Explain M2M Enabling Technologies. [7M]
b) Explain M2M/IoT Standardization – Protocol Stack. [7M]
4. a) Which of the devices are used to connect IoT devices to a home network? [7M]
b) What are examples of IoT devices? Explain. [7M]
5. a) Discuss in detail about File Transfer Protocol. [7M]
b) Explain about TELNET. [7M]
6. a) Describe about Business Model Patterns in the Internet of Things. [7M]
b) Explain about Remote Usage and Condition Monitoring. [7M]
7. a) Summarize Sensor Network Technology in IoT. [7M]
b) Explain about Participatory Sensing. [7M]
