



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

Second Year CSE(AIML) – Semester I

DEPARTMENT OF AIML

ACADEMIC YEAR 2025-26

DEPARTMENT OF AIML

HANDOUT- INDEX

S.No	Contents
1	Vision, Mission, PEOs, POs, PSOs & COs
2	Institution Academic Calendar
3	Department Academic Calendar
4	Subject wise
i)	Syllabus Copy
ii)	Lesson Plan
iii)	Question Bank
iv)	End Examination Questions (Previous 3 Academic Year)
v)	Mid-1 & Mid-2 Questions (Previous 3 Academic Year)



SRIINDUCOLLEGE OF ENGINEERING & TECHNOLOGY

B. TECH – CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

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 economic and technological development of the region, state and nation.

DEPARTMENT VISION

To develop competent engineers in the domain of Artificial Intelligence & Machine Learning for noteworthy contributions to the society.

DEPARTMENT MISSION

The Department has following Missions:

- DM1** To strengthen academic collaborations for better exposure.
- DM2** Promote professional environment to imbibe ethical values and entrepreneurial skills.
- DM3** Encourage research development by emphasizing on innovation.
- DM4** Facilitate Industry-Institute collaboration for mutual benefit

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Generate contributions towards advancements in Artificial Intelligence and Machine Learning.

PEO2: Promote design, research and implementation of products through strong communication skills, leadership and entrepreneurial skills.

PEO3: Apply basic principles and practices of AIML to successfully complete software related projects to meet customer business objectives and/or productively engage in research.

PO	Description
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 8	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 9	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 10	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 11	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
Program Specific Outcomes	

PSO 1	Register mathematical methodology to crack problems using suitable data structures
PSO 2	Competence to design and develop software for web based and mobiles androids under real world environment
PSO 3	Skill to design the algorithms for machine learning, data compression can be used in different applications.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	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

Academic Calendar



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution under UGC, New Delhi)
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NBA & NAAC Accredited. Approved by AICTE and Permanently affiliated to JNTUH
Sheriguda (V), Ibrahimpatnam, R.R. Dist, Hyderabad - 501 510

D4

ANNEXURE -III

BR-22

Lr.No.SICET/AUTO/DAE/II- B.Tech Academic Calendar/30/2025

B.TECH II-YEAR I-SEM & II-SEM ACADEMIC CALENDAR **(FOR ACADEMIC YEAR : 2025-26)**

Academic Calendar for B.Tech – IInd Year Students (2024 - 25 Batch), BR-22 Regulation.

I – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	01.08.2025 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	01.08.2025 – 07.10.2025	9 Weeks
3.	I Mid Term Examinations.	08.10.2025 – 10.10.2025	3 Days
4.	Submission of I Mid Term Examination Marks.	16.10.2025	
5.	2 nd Spell of Instructions for Remaining Two and a half Units.	13.10.2025 – 13.12.2025	9 Weeks
6.	II Mid Term Examinations.	15.12.2025 – 17.12.2025	3 Days
7.	Preparation Holidays and Practical Examinations	18.12.2025 – 27.12.2025	1 Week
8.	Submission of II Mid Term Examination Marks.	23.12.2025	
9.	I Semester End Examinations.	29.12.2025 – 10.01.2026	2 Weeks
Commencement of Class-Work for II B.Tech - II Semester 19.01.2026			

Note: No of Working/instructional days : 92

II – Semester

S.No.	EVENT	PERIOD	DURATION
1.	Commencement of class work.	19.01.2026 (Monday)	
2.	1 st Spell of Instructions for covering First Two and a half Units.	19.01.2026 – 14.03.2026	8 Weeks
3.	I Mid Term Examinations.	16.03.2026 – 18.03.2026	3 Days
4.	Submission of I Mid Term Examination Marks.	24.03.2026	
5.	2 nd Spell of Instructions for Remaining Two and a half Units.	20.03.2026 – 09.05.2026	7 Weeks
6.	Continuation of remaining 2 nd Spell of Instructions	25.05.2026 – 10.06.2026	2 Weeks
7.	II Mid Term Examinations.	11.06.2026 – 13.06.2026	3 Days
8.	Preparation Holidays and Project Evaluation.	15.06.2026 – 20.06.2026	1 Week
9.	Submission of II Mid Term Examination Marks.	18.06.2026	
10.	II Semester End Examinations	22.06.2026 – 04.07.2026	2 Weeks

Note: No of Working/instructional days : 92

ACE

CE

DIRECTOR

PRINCIPAL

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

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

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

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

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

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

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

Department Calendar

SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(AI&ML) DEPARTMENT CALENDAR – 2025-2026(SEMESTER-I)

SUNDAY				SEPTEMBER				DECEMBER	
MONDAY		JULY	1	IV-I MID I EXAMS				1	IV-I END EXAMS
TUESDAY	1	DEPARTMENT MEETING FOR IV-I & III-I 2025-2026		2	IV-I MID I EXAMS	OCTOBER		2	IV-I END EXAMS
WEDNESDAY	2			3	IV-I MID I EXAMS	1	III-I CRT CLASSES	3	IV-I END EXAMS
THURSDAY	3		AUGUST	4	IV-I SPELL 2 CLASSES	2	GANDHI JAYANTI & DASHARA	4	IV-I END EXAMS 1
FRIDAY	4		II-I SPELL I CLASSES COMMENCEMENT	5		3	III-I CRT CLASSES	5	IV-I END EXAMS 2
SATURDAY	5		DEPARTMENT MEETING	6		4	III-I CRT CLASSES	1	WOKSHOP UNDER AI CLUB 6
SUNDAY	6			7		5		2	
MONDAY	7	IV-I SPELL I CLASSES COMMENCEMENT	4	8		6	III-I CRT CLASSES	3	8
TUESDAY	8		5	9		7	III-I CRT CLASSES	4	9
WEDNESDAY	9		6	10	IV-I MID I EXAMS SUBMISSION	8	III-I MID I EXAMS & II-I MID I EXAMS	5	10
THURSDAY	10		7	11		9	III-I MID I EXAMS & II-I MID I EXAMS	6	11
FRIDAY	11		8	12	DEPARTMENT MEETING REVIEW ON IV-I SLOW LEARNERS	10	III-I MID I EXAMS & II-I MID I EXAMS	7	12
SATURDAY	12	AI CLUB MEETING	9	13	AI CLUB MEETING	11		8	13
SUNDAY	13		10	14		12		9	14
MONDAY	14	III-I SPELL I CLASSES COMMENCEMENT	11	15	III-I CRT CLASSSES	13	II-I & III-I SPELL 2 CLASSES	10	15
TUESDAY	15		12	16	III-I CRT CLASSSES	14		11	16
WEDNESDAY	16		13	17	III-I CRT CLASSSES	15		12	17
THURSDAY	17		14	18	III-I CRT CLASSSES	16	II-I & III-I MID I EXAMS SUBMISSION	13	18
FRIDAY	18		15	19	III-I CRT CLASSSES	17	DEPARTMENT MEETING REVIEW ON II-I & III-I SLOW LEARNERS	14	19
SATURDAY	19		16	20	III-I CRT CLASSSES	18	AI CLUB MEETING	15	20
SUNDAY	20		17	21	BATHUKA MIMA	19		16	21
MONDAY	21	BONALU HOLIDAY	18	22	III-I CRT CLASSSES	20	DINAAJI	17	22
TUESDAY	22		19	23	III-I CRT CLASSSES	21		18	23

MONDAY	25	CHRISTMAS HOLIDAY	29		26		25		28		27	III-II 2 ND SPELL CLASS WORK	24	III-II SEM END EXAMS,III-II MID-II EXAMS	30	
TUESDAY	26	BOXING DAY HOLIDAY	30		27		26		30		28		25	III-II SEM END EXAMS,III-II MID-II		
WEDNESDAY	27		31		28		27				29		26	III-II SEM END EXAMS,III-II MID-II EXAMS	31	
THURSDAY	28				29		28				30		27	III-II PREPARATION HOLIDAYS PRACTICAL EXAMS		
FRIDAY	29						29	GOOD FRIDAY HOLIDAY			31		28	III-II PREPARATION HOLIDAYS PRACTICAL EXAMS		
SATURDAY	30						30						29	III-II PREPARATION HOLIDAYS PRACTICAL EXAMS		
SUNDAY	31						31						30			
MONDAY																
CALENDAR INCHARGE						HOD									PRINCIPAL	

SYLLABUS

BR22 – B.TECH. – CSE(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

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

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

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, B- Trees, B+ Trees, 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.

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2 nd 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 BOOK:

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



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

Prepared on:
19.07.2025

Sub.Code & Title	R22CSE2112 Data Structures		
AcademicYear:2025-2026	Year/Sem./Section	II-I	
Faculty Name & Designation	B. Pavan Kumar, Assistant Professor/P.Hima Bindu , 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	Introduction					16		
1.1	Introduction to Data Structures	R1	3	8	Blackboard	02		CO1,L1
1.2	Abstract datatypes	R1	9	15	Blackboard	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	Blackboard	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	Blackboard	02		CO1,L1
1.7	Queues-operations	R1	148	150	Blackboard	01		CO1,L2
1.8	Queues using array	R1	150	150	Blackboard	02		C01,L2
1.9	Queues using Linked list	R1	151	158	Blackboard	02		CO1,L1
	Review	Signature of the HOD/Coordinator						
UNIT-II								
II	Dictionaries					10		
2.1	Dictionaries :linear list representation	T1	395	395	Blackboard	01		CO2,L1
2.2	Skip list representation	T1			Blackboard	01		CO2,L1
2.3	operations-insertion, deletion and searching	T1			Power point Presentation	01		CO2,L2
2.3	Hash Table Representation: hash functions	R1	397	398	Power point Presentation	01		CO2,L2
2.4	Collision resolution-separate chaining	R1	620	621	Blackboard	02		CO2,L2
2.5	Open addressing-linear probing	R1	623	624	Blackboard	02		CO2,L3
2.6	Quadratic probing,,double hashing	R1	625	625	Blackboard	01		CO2,L3
2.7	Rehashing ,extendible hashing	R1			Blackboard	01		CO2,L2

	Review	Signature of the HOD/Coordinator	
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Unit/ Item No.	Topic(s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT-III								
III	Search Trees					13		
3.1	Search Trees: Binary Search Trees, Definition	T1	226	226	Seminar	02		CO4,L3
3.1.1	Implementation, Operations-Searching, Insertion	T1	227	228	Blackboard	01		CO4,L4
3.1.2	Deletion of elements	T1	230	231	Blackboard	01		CO4,L3
3.2	B-Trees	T1			Blackboard	02		CO4,L4
3.3	B+ Trees	T1			Blackboard	02		CO4,L4
3.4.1	AVL Trees ,Definition, Height of an AVL Tree	R1	341	342	Power point Presentation	01		CO4,L4
3.4.2	Operations–Insertion, Deletion and Searching,	R1	348	348	Blackboard	01		CO4,L4
3.4.2	Deletion and Searching,	R1	349	351	Blackboard	01		CO4,L3
3.5	Red–Black	T1	518	525	Blackboard	01		CO4,L3
3.6	Splay Trees	T1	542	542	Blackboard	01		CO4,L3
	Review	Signature of the HOD/Coordinator						
UNIT-IV								
IV	Graphs					10		
4.1	Graphs :Graph Implementation	T1	257	263	Blackboard	01		CO4,L2
4.2	Graph Traversal Methods	T1	272	273	Blackboard	02		CO4,L2
4.3	Sorting: Quicksort	T1			Blackboard	01		CO3, L4
4.3	Heap Sort	T1	347	347	Blackboard	02		CO3,L4
4.4	External Sorting	T1	372	372	Blackboard	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	Blackboard	01		CO3,L4
	Review	Signature of the HOD/Coordinator						
V	Pattern Matching and tries					07		
5.1	Pattern Matching and Tries	T1	557	561	Blackboard	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	-	-	Blackboard	01		CO6,L6
5.5	Compressed Tries	W8	-	-	Blackboard	01		CO6,L6
5.6	Suffix tries	W8	-	-	Blackboard	01		CO6,L6
	Review	Signature of the HOD/Coordinator						

LIST OF TEXT BOOKS AND REFERENCES

TEXTBOOKS:

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.

WEBLINKS

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://nptel.ac.in/courses/106/105/106105085/>

W5. <https://nptel.ac.in/courses/106/105/106105085/>

W6. <https://www.coursera.org/specializations/data-structures-algorithms>

W7. <https://www.edx.org/course/data-structures-fundamentals>

W8. <https://www.geeksforgeeks.org/boyer-moore-algorithm-for-pattern-searching/>

W9. <https://www.geeksforgeeks.org/kmp-algorithm-for-pattern-searching/>

W10. <https://www.geeksforgeeks.org/types-of-tries/>

CONTENT BEYOND THE SYLLABUS

S. No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	Binary Tree, Terminology	NPTEL		Dr Kishore Verma	PO1, PO4	PSO1
2	List implementation using Array	NPTEL		Dr Kishore Verma	PO1	PSO1

SELF STUDY TOPICS

S. No.	Topics	Books &	Course Outcomes
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		Journals	
1	Circular Queue	Data structures through c by “Yashvanth Kanetkar”	CO1,CO2
2	Double Ended queue	Data structures through C by “Yashvanth Kanetkar”	CO1,CO2

Assignment - I

SET	Assignment Questions	Course outcome	BT Level	Register Number
1	Describe Linked list? Distinguish between array and linked list?	CO1	L2	
	Write a program to implement stack using Linked list?	CO1	L3	
	Write about Hash table and Hash function?	CO2	L3	
	Explain chaining and open addressing methods for detecting collision and overflow?	CO2	L2	
	Write a procedure to perform insertion deletion and searching in Binary search tree?	CO3	L6	
2	Discuss about implementation of single linked list?	CO1	L2	
	Write about Queue representation using array.	CO1	L2	
	Compare between Quadratic probing and double hashing.	CO2	L4	
	Demonstrate skip list representation and its node structure?	CO2	L3	
	Explain in detail about deletion of an element in BST in	CO3	L2	
3	Explain the following data structures.	CO1	L2	
	Write about Stack representation using linked list?	CO1	L3	
	Write about Quadratic Probing collision handling techniques.	CO2	L3	
	What is hashing? Explain the differentiation between hashing and	CO2	L2	
	Explain about B- tree?	CO3	L2	
4	Write a program to implement Insertion, deletion operations by using the single Linked list?	CO1	L3	
	Write about Queue representation using array?	CO1	L3	
	What are the two methods of representing Liner list? Explain with example?	CO2	L2	
	Discuss about the Rehashing Technique and its advantages?	CO2	L2	
	Define Binary search tree? Construct binary search tree step by step with diagrams using list of numbers	CO3	L6	
5	Write a program to implement Circular queue using an array?	CO1	L3	

	Convert the following infix expression into postfix expression A + B – C * D * E \$ F \$ G	CO1	L3	
	Explain about: a. Rehashing b. Extendible hashing.	CO2	L2	
	What are different methods of collision resolution in hashing?	CO2	L2	
	a) List the operations in Binary Search Tree?	CO3	L1	
	b) How to find order of B Tree?			
6	Write an algorithm to push and pop an element from stack in	CO1	L3	
	Compare Single linked list with Double linked list.	CO1	L4	
	What is collision? Explain different collision resolution techniques with examples?			
	What is collision? Explain different collision resolution techniques with examples?	CO2	L2	
	What is Hashing? What are various Hash table representations and explain various hash functions?	CO2	L2	
	Explain briefly about binary search trees.	CO3	L2	
7	Distinguish between Linear and Non linear data structure.	CO1	L4	
	Explain about stack and queue applications.	CO1	L2	
	What is collision and explain how collision occurs.	CO2	L2	
	What are the two methods of representing linear list. Explain with example.	CO2	L2	
	Define Binary search tree? Construct binary search tree step by step with diagrams using list of numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)	CO3	L1	
8	Explain about infix to postfix expression conversion with examples.	CO1	L2	
	Differentiate between array and linked list.	CO1	L4	
	Discuss the term dictionary. What are the various applications of dictionary?	CO2	L6	
	Explain how chaining and open addressing methods for detecting collision and overflow.	CO2	L2	
	How to find order of B Tree?	CO3	L1	
9	Define stack with a example and write the logic to push and pop an element using array.	CO1	L1	
	Explain the following. a. Data Structure	CO1	L2	
	Discuss about the rehashing technique and its advantages.	CO2	L6	
	Write about Hash table and Hash function.	CO2	L3	
	List the operations in Binary Search Tree	CO3	L1	
10	Define stack with a example and write the logic to push and pop an element using linked list.	CO1	L1	
	Explain the following. a. Linear data structure b. Non linear data structure	CO1	L2	
	Explain the following concepts a. Double Hashing b. Rehashing	CO2	L2	
	Explain the concept of Extendible hashing with suitable example.	CO2	L5	
	Explain briefly about binary search trees.	CO3	L5	

11	What is linear list and write a program to implement the concept of linked list.	CO1	L3	
	List out the advantages and disadvantages of Array and Linked list.	CO1	L4	
	Explain the concept of separate chaining with suitable example.	CO2	L5	
	Explain the skip list.	CO2	L2	
	Write a procedure to perform insertion deletion and searching in Binary search tree?	CO3	L3	
12	Write a stack program using arrays.	CO1	L3	
	List out the linked list operations and implement the logics	CO1	L4	
	List out various types of hash functions.	CO2	L1	
	Discuss about Rehashing technique and its advantages.	CO2	L6	
	Define Binary search tree? Construct binary search tree step by step with diagrams using list of numbers	CO3	L1	
13	Write a program for queue using linked list.	CO1	L3	
	Differentiate between single and double linked list.	CO1	L4	
	Discuss the term Dictionary. What are the various applications of Dictionary?	CO2	L6	
	List out the difference between Linear probing and quadratic probing.	CO2	L1	
	Write a program to perform following operations in B tree?	CO3	L3	
14	Write a program for stack using linked list.	CO1	L3	
	Discuss about a. Linked List b. Double Linked List	CO1	L6	
	Discuss about rehashing technique and its advantages.	CO2	L6	
	Explain the difference between hashing and skip list.	CO2	L5	
	Write a procedure to perform insertion deletion and searching in Binary search tree?	CO3	L3	

ASSIGNMENT – II

SET	Assignment Questions	Course outcome	BT Level	Register Number
1	What is AVL tree? Illustrate different rotations in AVL tree with example?	CO4	L1	
	Write about various Graph representation techniques.	CO5	L3	
	Explain about Heap Sort with example.	CO5	L2	
	Explain about Boyer Moore pattern matching algorithm.	CO6	L2	
	Write about Knuth-Morris pattern matching algorithm.	CO6	L3	
2	List out the rules of Red Black tree.	CO4	L1	
	Explain DFS with example.	CO5	L2	
	Discuss about Merge Sort technique with example.	CO5	L2	

	Explain about compressed Trie with an example.	CO6	L2	
	Differentiate between Standard Tries and Compressed	CO6	L4	
3	Differentiate between AVL tree and Binary	CO4	L4	
	Distinguish between Heap Sort & Merge Sort.	CO5	L2	
	Explain DFS traversal with example.	CO5	L5	
	Write an algorithm for Compressed Tries.	CO6	L3	
	Differentiate between Standard Tries & compressed Tries.	CO6	L4	
4	Write a program to perform following operations in B+ Tree. A) Insertion B) Deletion.	CO4	L3	
	Write a program to implement BFS.	CO5	L3	
	What are the applications of Quick Sort & Merge Sort.	CO5	L1	
	Explain the features of Boyer Moore algorithm.	CO6	L2	
	Discuss about various types of Tries.	CO6	L2	
5	Discuss about various rotations in Splay Trees.	CO4	L2	
	Discuss about Merge Sort with suitable example.	CO5	L2	
	Explain about: a. BFS b. DFS	CO5	L5	
6	Explain about Knuth Morris pattern matching algorithm.	CO6	L5	
	Explain Brute force algorithm with an example.	CO6	L5	
	Construct an AVL tree with the following elements.	CO4	L3	
	List out the Pros & Cons of quick sort.	CO5	L4	
		CO5	L1	
7	What are the applications of Quick Sort & Merge Sort.	CO6	L2	
	Draw the Standard Trie and Compressed Trie for the following String {area, array, aim, acid, act, rest, rate, ratio}	CO6	L5	
	Explain the features of Boyer Moore algorithm.	CO6		
	List out the rules of Red Black Tree.	CO4	L4	
8	Explain about external Sorting with an example.	CO5	L2	
	Write about various Graph representation techniques.	CO5	L3	
	Explain about Boyer Moore pattern matching algorithm.	CO6	L2	
	Write about Knuth-Morris pattern matching algorithm.	CO6	L3	
8	Explain AVL Tree with an example for single ~~rotation and double rotation~~	CO4	L2	
	What is sorting? Discuss about the different types of ~~Sorting Techniques in data structure~~	CO5	L1	
	Write an algorithm for BFS.	CO5	L3	
	Draw the Standard Trie and Compressed Trie for the following String	CO6	L2	
	Explain the features of Boyer Moore algorithm.	CO6	L2	

9	What is an AVL Tree? Give one example?	CO4	L1	
	Differentiate between BFS and DFS.	CO5	L4	
	Write the advantages and disadvantages of quick sort.	CO5	L3	
	Differentiate standard tries and compressed tries?	CO6	L4	
	Explain the Brute-force algorithm with an example.	CO6	L5	
10	How do implement a splay tree? Why to prefer ~~only trees?~~	CO4	L1	
	Explain Depth first search traversal with ~~example?~~	CO5	L2	
	Discuss about merge sort technique with suitable example?	CO5	L2	
	Write an algorithm of standard trie.	CO6	L3	
	Draw the Standard Trie and Compressed Trie for the following ~~String~~	CO6	L2	
11	Differentiate AVL tree and Binary search tree?	CO4	L4	
	Differentiate between BFS and DFS.	CO5	L4	
	Explain about quick sort technique with suitable ~~example?~~	CO5	L5	
	Explain about the compressed trie with an example.	CO6	L5	
	What are the advantages of trie? Compare trie with Hash table?	CO6	L1	
12	Explain Single rotation and double rotation in AVL tree ~~with an example~~	CO4	L5	
	Distinguish between heap sort and merge sort.	CO5	L2	
	Write a program to implement depth first search?	CO5	L3	
	Discuss about various types of tries.	CO6	L2	
	Explain Boyer Moore pattern matching algorithm?	CO6	L5	
13	List out the rules of Red Black tree and explain with an ~~example~~	CO4	L4	
	Explain about heap sort with example?	CO5	L5	
	Differentiate between BFS and DFS.	CO5	L4	
	Differentiate standard tries and compressed tries?	CO6	L4	
	Explain about the Suffix tries with an example.	CO6	L5	
14	a) Explain a balance factor in AVL tree with example? b) Explain representation of AVL tree with example?.	CO4	L5	
	Classify the types of graphs? Explain basic terminologies ~~in graph?~~	CO5	L4	
	Explain Breadth first search traversal with example?	CO5	L5	
	Write an algorithm of standard trie.	CO6	L3	
	Explain about Knuth-Morris-pratt pattern matching algorithm?	CO6	L5	



SRI INDU COLLEGE OF ENGG & TECH
QUESTIONBANK
 (Regulation: R22)
 Department of AIML

(Regulation:R22)

Sub. Code &Title

(R22CSE2112) DATASTRUCTURES

AcademicYear:2025-26

Year/Sem.

II-I / CSE(AIML)

Faculty Name & Designation

Mr.B.Pavan Kumar , Assistant Professor

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

1C-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	L1	CO1
1C-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	L1	CO1
1C-3	Identify the data structure which allows deletions at both ends of the list but insertion at only one end. a)Stack b)Priorityqueues c)Output restricted dequeue d)Input restricted dequeue	L3	CO1
1C-4	Which of the following data structure is non linear type? a)Graph b)Stacks c)Lists d)None of the above	L1	CO1

1C-5	Which data structure is used in breadth first search of a graph to hold nodes? a) Array b) Tree c) Stack d) queue	L1	CO1
1C-6	When new data are to be inserted into a data structure, but there is not available space; this situation is usually called..... a) overflow b) Underflow c) house full d) memory full	L1	CO1
1C-7	What is a data structure? a) A programming language b) A collection of algorithms c) A way to store and organize data d) A type of computer hardware	L1	CO1
1C-8	Which data structure is based on the Last In First Out (LIFO) principle? a) Tree b) Linked List c) Stack d) Queue	L1	CO1
1C-9	Which of the following statement(s) about stack data structure is/are NOT correct? 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	L1	CO1
1C-10	Which data structure is needed to convert infix notation to postfix notation? a) Tree b) Branch c) Stack d) Queue	L1	CO1
1C-11	What is the value of the postfix expression 6 3 2 4 + - *? a) 74 b) -18 c) 22 d) 40	L1	CO1
1C-12	The data structure required for Depth First Traversal on a graph is? a) Array b) Stack c) Tree d) Queue	L5	CO1
1C-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	L1	CO1

1C-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)	L1	CO1
1C-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--	L1	CO1
1F- 1	Stack and Queue are_____data structures.	L1	CO1
1F-2	----- data structure is used to evaluate postfix expression.	L1	CO1
1F-3	Types of linked lists are -----	L1	CO1
1F-4	----- Condition indicates Stack underflow.	L2	CO1
1F-5	Queue is full when -----	L1	CO1
1F-6	Draw the example circular linked list -----	L1	CO1
1F-7	Advantage of a circular queue is -----	L1	CO1
1F-8	Operations on stack are -----	L1	CO1
1F-9	Differences between single and double linked list are-----	L4	CO1
1F-10	Disadvantage of linked lists are -----	L2	CO1
1F-11	----- Pointers, double linked list node will have.	L2	CO1
1F-12	----- is the condition to become a queue full.	L4	CO1
1F-13	----- is the condition that specifies a queue contains single element.	L4	CO1
1F-14	Types of queues are -----	L1	CO1
1F-15	Applications of Queue are -----	L2	CO1
1M-1	Match the following a. Linear data structures b. Stack c. Applications of Stack d. Dequeue 1. LIFO list 2. Insertion and Deletion can be done from both ends 3. Stack ,Queue 4. Evaluating postfix expression	L1	CO1

1M -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	L1	CO1
1M -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	L1	CO1
1M -4	a. Queue b. Tree c. Stack d. Linear data structure	1.DFS 2.LIFO list 3.Stack 4.Non Linear data structure	L1	CO1
1M -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	L1	CO1

1D-1.	Discuss about implementation of single linked list?	L2	CO1
1D-2.	Write a program to implement single linked list?	L6	CO1
1D-3.	Explain the following data structures a)Stack operations b)Queue operations	L2	CO1
1D-4.	Write about Stack representation using array and linked list?	L1	CO1
1D-5.	Write about Queue representation using array and linked list?	L1	CO1
1D-6.	Write a program to implement stack using Linked list?	L1	CO1
1D-7.	Write a program to implement Queue using array?	L1	CO1
1D-8	Explain about Stack applications and Queue applications.	L2	CO1
1D-9	Describe Linked list? Distinguish between array and linked list?	L4	CO1
1D-10	Explain about following a) Data structure b) Abstract Data Type c) Linear data structure d) Non Linear Data structure.	L2	CO1
1D-11	Write the advantages of linked lists. Write an algorithm to insert and delete a node in single linked list.	L1	CO1
1D-12	Explain any two applications of stack with examples.	L2	CO1
1D-13	Compare Single linked list with Double linked list.	L4	CO1
1D-14	Define Data Structure. Write a brief note on different data structures with examples.	L1	CO1
1D-15	What are the limitations of Linear Queue. Explain operations of Circular queue.	L1	CO1

UNIT-II: Dictionaries			
	Multiple choice Questions	BTLevel	Course Outcome

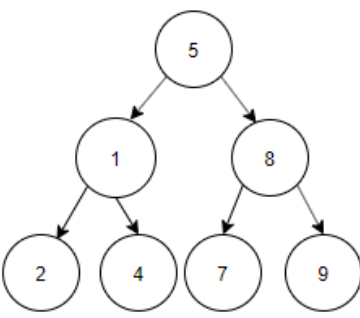
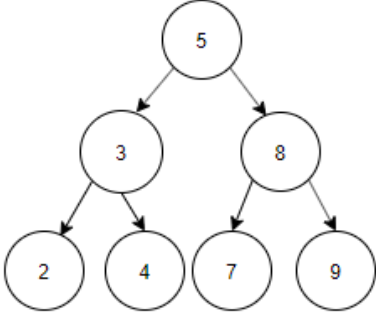
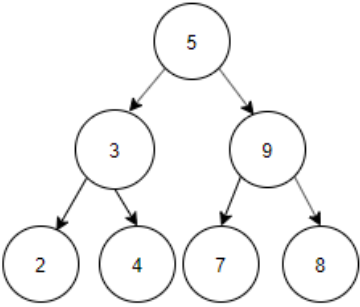
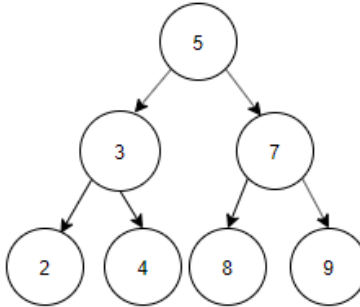
2C-1	If Every item of the list maps to a unique index in the hash table, the function is called_____ - Hash Free Table - Collision Table - Collision Free Table - Perfect Has Table	L1	CO2
2C-2	If the hash function is $h(\text{element}) = \text{element} \% 10$, so for which of the pair of values, the collision will take place ____ 15 and 14 12 and 2 1 and 10 11 and 22	L1	CO2
2C-3	What is a skip list? - a linked list with size value in nodes Collision Table - a linked list that allows faster search within an ordered sequence - a linked list that allows slower search within an ordered sequence - a tree which is in the form of linked list	L1	CO2
2C-4	Skip lists are similar to which of the following datastructure? - stack - Heap - Binary Search Tree - Balanced Binary Search Tree	L1	CO2
2C-5	The nodes in a skip list may have many forward references their number is determined. - Probabilistically - randomly - sequentially - orthogonally	L1	CO2
2C-6	Which of the following problems occur due to linear probing? - Primary collision - Secondary collision. - Separate chaining. - Extendible Hashing	L1	CO2
2C-7	Which of the following is not a collision resolution strategy for open addressing? - Linear probing - Quadratic probing - Double hashing - Rehashing	L1	CO2

2C-8	What is the hash function used in linear probing? a) $H(x) = \text{key} \bmod \text{table size}$ b) $H(x) = (\text{key} + F(i^2)) \bmod \text{table size}$ c) $H(x) = (\text{key} + F(i)) \bmod \text{table size}$ d) $H(x) = X \bmod 17$	L1	CO2
2C-9	What data organization method is used in hash tables? a) Stack b) Array c) Linked List d) Queue	L1	CO2
2C-10	In a hash table of size 10, where is element 7 placed? a) 6 b) 7 c) 17 d) 16	L1	CO2
2C-11	9. Which of the following is identical to that of a separate chaining hash node? a) Linked list b) Array c) Stack d) Queue	L2	CO2
2C-12	What is a hash table? a) A structure that maps values to keys b) A structure that maps keys to values c) A structure used for storage d) A structure used to implement stack and queue	L2	CO2
2C-13	Hashing technique which allocates fixed number of buckets is classified as a) dynamic hashing b) static hashing c) external hashing d) internal hashing	L2	CO2
2C-14	What is the load factor? a) Average array size b) Average key size c) Average chain length d) None of the mentioned	L2	CO2
2C-15	What is the search complexity in direct addressing? a) $O(n)$ b) $O(\log n)$ c) $O(n \log n)$ d) $O(1)$	L2	CO2

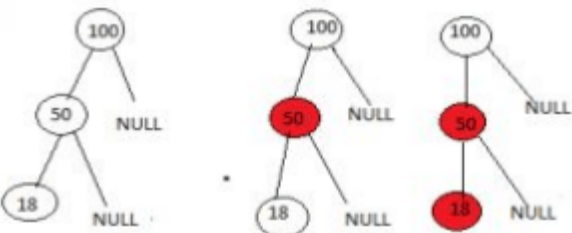
Fill in the blanks			
2F-1	The function that transforms a key into a table index is called_____.	L1	CO2
2F-2	_____Permits a hash table to expand and shrink dynamically.	L2	CO2
2F-3	_____using a secondary has function on the hash key on the item.	L2	CO2
2F-4	Hash collision can be dealt with techniques like_____	L1	CO2
2F-5	If h is a hash and key is a key, _____is called the hash of key.	L3	CO2
2F-6	A good hash function is one that minimizes_____	L2	CO2
2F-7	_____allows direct access to the table.	L2	CO2
2F-8	_____is a collection of pairs of key and value where every value is associated with the corresponding key.	L1	CO2
2F-9	_____method of hash function depends upon the reminder of division.	L2	CO2
2F-10	The situation in which the hash function returns the same hash key (home bucket) for more than one record is called_____	L1	CO2
2F-11	_____lists are made up of a series of nodes connected one after the other, contains a key and value pair.	L2	CO2
2F-12	_____is a technique in which a second hash function is apply to the key when a collision occurs.	L3	CO2
2F-13	_____hashing is a dynamically updatable disk based index structure which implement a hashing scheme utilizing a dictionary.	L2	CO2
2F-14	Uniform hashing is defined as any newly inserted elements is equally likely to be placed at any of the empty positions of the_____	L1	CO2
2F-15	Re-hashing involves using_____hash function on the hash key of the item.	L1	CO2
Match the following			
2M-1	a. Hashing b. Collision c. Hash Function d. Dictionary	1. General purpose data structure for storing a group of objects. 2. To derive the physical location of a record 3. Process of using a math function to convert input data into fixed length output. 4. Occurs when more than one value to be hashed	L1 CO2
2M-2	a. List of Bank Accounts b. Skip List c. $H(\text{key}) = (\text{Hash}(\text{key}) + i2) \% m$ d. Using 2 keys	1. Double Hashing 2. Quadratic Probing 3. Example of dictionary 4. Variant in linked list	L1 CO2
2M-3	a. Rehashing b. Skip List c. Hashing will be done based d. Extendible Hashing	1. Does not require hashing 2. Hash Function 3. Growing and Shrinking 4. Table is resized	L1 CO2

2M-4	a. Time complexity of hash table chaining b. Best case time complexity of insertion in hash table c. Space complexity (if M keys) d. Hash function maps	1.Keys to buckets 2.O(M) 3.O(n) 4.O(1)	L1	CO2
2M-5	a. Abstract data Type b. Open Hashing c. Increase and decrease in size d. Closed Hashing	1.Rehashing 2. Dictionary 3. Collision results in storing one of the records at another slot in the table 4. Whether collisions are stored outside the table.	L1	CO2
5-MARKSQUESTIONS				
2D-1.	Discuss the term Dictionary? What are the various applications of Dictionary and Hashing?		L2	CO2
2D-2.	Write about Hash table and Hash function?		L1	CO2
2D-3.	What are the various types of hash functions.		L1	CO2
2D-4.	Demonstrate skip list representation and its node structure with example?		L3	CO2
2D-5.	Explain how does collision occur?		L2	CO2
2D-6.	Explain chaining and open addressing methods for detecting collision and overflow?		L2	CO2
2D-7.	Write about Quadratic Probing collision handling techniques.		L1	CO2
2D-8	Write about Double hashing collision handling techniques.		L1	CO2
2D-9	Discuss about the Rehashing Technique and its advantages?		L2	CO2
2D-10	Explain the concept of extensible hashing with suitable example.		L2	CO2
2D-11	What is hashing? Explain the differentiation between hashing and skip list?		L2	CO2
2D-12	Assuming the table size as the smallest prime number greater than the input size, as the hash the following keys : 62,56,45,14,78,44,36,29 & 39 to handle collisions use linear probing & quadratic probing.		L4	CO2
2D-13	What are the uses of extensible hashing?		L1	CO2
2D-14	Compare between Quadratic probing and double hashing.		L4	CO2
2D-15	What are the two methods of representing Liner list? Explain with example		L2	CO2

UNIT-III Search Trees			
	Multiple choice Questions	BT Level	Course Outcome

3C-1	Which of the following traversal outputs the data in sorted order in a BST? a) Preorder b) Inorder c) Postorder d) Level order	L1	CO3
3C-2	The height of a binary tree is the maximum number of edges in any root to leaf path. The maximum number of nodes in a binary tree of height h is: () a) $2^h - 1$ b) $2^{(h-1)} - 1$ c) $2^{(h+1)} - 1$ d) $2 * (h+1)$	L1	CO3
3C-3	What is the average case time complexity for finding the height of the binary tree? a) $h = O(\log \log n)$ b) $h = O(n \log n)$ c) $h = O(n)$ d) $h = O(\log n)$	L1	CO3
3C-4	Construct a binary search tree by using post order sequence given below. Post order: 2, 4, 3, 7, 9, 8, 5.  a)  b)  c)  d)	L6	CO3
3C-5	The run time for traversing all the nodes of a binary search tree with n nodes and printing them in an order is a) $O(n \lg(n))$ b) $O(n)$ c) $O(\sqrt{n})$ d) $O(\log(n))$	L3	CO3

3C-6	What is the maximum number of keys that a B+ -tree of order 3 and of height 3 have? a) 3 b) 80 c) 27 d) 26	L1	CO3
3C-7	What is an AVL tree? a) a tree which is balanced and is a height balanced tree b) a tree which is unbalanced and is a height balanced tree c) a tree with three children d) a tree with atmost 3 children	L1	CO4
3C-8	What is the maximum height of an AVL tree with p nodes? a) p b) $\log(p)$ c) $\log(p)/2$ d) $p/2$	L1	CO4
3C-9	Why to prefer red-black trees over AVL trees? a) Because red-black is more rigidly balanced b) AVL tree store balance factor in every node which costs space c) AVL tree fails at scale d) Red black is more efficient	L2	CO4
3C-10	Which one of the following data structures are preferred in database-system implementation? a) AVL tree b) B-tree c) B+ - tree d) Splay tree	L1	CO3
3C-11	What is the disadvantage of using splay trees? a) height of a splay tree can be linear when accessing elements in non-decreasing order b) splay operations are difficult c) splay tree performs unnecessary splay when a node is only being read d) no significant disadvantage	L1	CO4
3C-12	What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0. a) 2 b) 3 c) 4 d) 5	L4	CO4

3C-13	Consider the below formations of red-black tree.  All the above formations are incorrect for it to be a redblack tree. then what may be the correct order? a) 50-black root, 18-red left subtree, 100-red right subtree b) 50-red root, 18-red left subtree, 100-red right subtree c) 50-black root, 18-black left subtree, 100-red right subtree d) 50-black root, 18-red left subtree, 100-black right subtree	L1	CO4
3C-14	When to choose Red-Black tree, AVL tree and B-trees? a) many inserts, many searches and when managing more items respectively b) many searches, when managing more items respectively and many inserts respectively c) sorting, sorting and retrieval respectively d) retrieval, sorting and retrieval respectively	L3	CO4
3C-15	10. What is the below pseudo code trying to do, where pt is a node pointer and root pointer? <pre> redblack(Node root, Node pt): if(root == NULL) return pt if(pt.data < root.data) { root.left = redblack(root.left, pt); root.left.parent = root } elseif(pt.data > root.data) { root.right = redblack(root.right, pt) root.right.parent = root } return root </pre> a) insert a new node b) delete a node c) search a node d) count the number of nodes	L6	CO3
3C-16	B-tree of order n is a order-n multi way tree in which each non-root node contains _____ a) at most $(n - 1)/2$ keys b) exact $(n - 1)/2$ keys c) at least $2n$ keys d) at least $(n - 1)/2$ keys	L1	CO3

Fill in the blanks			
3F-1	Breadth First Search (BFS) is started on a binary tree beginning from the root vertex. There is a vertex t at a distance four from the root. If t is the n-th vertex in this BFS traversal, then the maximum possible value of n is _____	L4	CO3
3F-2	What is the special property of red-black trees and what root should always be _____	L1	CO4
3F-3	What maximum difference in heights between the leafs of a AVL tree is possible _____	L4	CO4
3F-4	Efficiency of finding the next record in B+ tree is _____	L1	CO3
3F-5	The most widely used external memory data structure is _____	L3	CO3
3F-6	An AVL tree is an improved version of the _____	L6	CO4
3F-7	Maximum depth of an AVL tree with n nodes is _____	L3	CO4
3F-8	_____ is an application of splay trees	L2	CO4
3F-9	What is a splay operation _____	L1	CO4
3F-10	What are the worst case and average case complexities of a binary search tree is _____	L4	CO3
3F-11	What are the operations that could be performed in $O(\log n)$ time complexity by red-black tree is _____, _____, _____, _____	L1	CO4
3F-12	If a node has K children in B tree, then the node contains exactly-----keys.	L1	CO3
3F-13	A B+ tree can contain a maximum of 7 pointers in a node. What is the minimum number of keys in leaves _____	L3	CO3
3F-14	What minimum difference in heights between the leafs of a AVL tree is possible _____	L4	CO4
3F-15	The complexity of searching, inserting and deletion in AVL tree is _____	L4	CO4
Match the following			
3M-1	a. B tree b. <u>Zig rotation</u> c. A Red Black Tree d. A tree has 0 or 2 childrens	1. Full Binary Tree 2. <u>1972</u> 3. The node is rotated towards its right. 4. height-balanced m-way tree	L1 CO3
3M -2	a. Minimum number of nodes in full binary tree b. Non Linear Hierarchical DS c. Minimum height of full binary tree d. Minimum number of nodes in a full binary tree	1. $\log(n)$ where n is the number of nodes 2. $2.2^h - 1$ 3. Tree 4. $\log_2(n+1) - 1$	L1 CO3
3M -3	a. Root b. Siblings c. Level 0 d. Leaf Node	1. Root Node 2. First node of the tree 3. Node with no child 4. That belong to the same parent	L1 CO3
3M -4	a. AVL tree Invented by b. Self balancing BST	1. Splay Tree 2. Total number of children of a node	 CO4

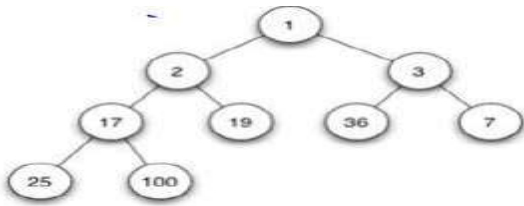
	c. Zig Zag Rotation d. Degree	3. Red Black tree 4. GM Adelson	L1	
3M -5	a. Order of complexity (average time of RB tree) b. Order of complexity (Worst case time of RB tree) c. Worst case complexity of Splay d. Total time complexity of B+ Tree(Search)	1. O(n) 2. O(t lont n) 3. O(1) 4. O(logn)	L1	CO4
5 - MARKS QUESTIONS				
3D-1.	Write a procedure to perform insertion deletion and searching in Binary search tree?		L1	CO3
3D-2.	Explain in detail deletion of an element in BST in different cases?		L2	CO3
3D-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		L1	CO3
3D-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}.		L1	CO3
3D-5.	Describe AVL Tree? Illustrate different rotations in AVL tree for balancing with appropriate example?		L2	CO4
3D-6.	Write list of operations perform on AVL tree with example?		L1	CO4
3D-7.	a) Explain a balance factor in AVL tree with example? b) Explain representation of AVL tree with example?		L2	CO4
3D-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}		L3	CO4
3D-9	Write a program to perform following operations in B+ tree? a) Insert an element into a B+ tree b) Delete an element from a B+ tree		L1	CO3
3D-10	What is Splay tree ? Illustrate Splay-tree with example?		L2	CO3
3D-11	a) List the operations in Binary Search Tree? b) How to find order of B Tree?		L1	CO3
3D-12	What is an AVL Tree? Give one example?		L1	CO4
3D-13	List the rules of Red-Black Tree? And explain with example?		L1	CO4
3D-14	Differentiate AVL tree and Binary search tree?		L4	CO4
3D-15	How do implement a splay tree? Why to prefer splay trees?		L1	CO4

UNIT – IV

OBJECTIVE TYPE QUESTIONS

**BT
Level**

**Course
Outcome**

4C-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	L1	CO5
4C-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	L3	CO5
4C-3	Heap can be used as _____ a) priority queue b) stack c) a decreasing order array d) none of the mentioned	L3	CO5
4C-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	L2	CO5
4C-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	L1	CO5
4C-6	Descending priority queue can be implemented using _____ a) max heap b) min heap c) min-max heap d) trie	L3	CO5
4C-7	Min heap can be used to implement selection sort. a) true b) false	L3	CO5

4C-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	L1	CO5
4C-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) $O(n)$	L3	CO5
4C-10	If the given input array is sorted or nearly sorted, which of the following algorithms gives the best performance? a) Insertion sort b) Selection sort c) Quick sort d) Merge sort	L1	CO5
4C-11	The time complexity of heap sort in worst case is a) $O(\log n)$ b) $O(n)$ c) $O(n \log n)$ d) $O(n^2)$	L5	CO5
4C-12	Counting sort performs Numbers of comparisons between input elements. a) 0 b) n c) $n \log n$ d) n^2	L4	CO5
4C-13	Which of the following sorting algorithms has the running time that is least dependent on the initial ordering of the input? a) Insertion sort b) Quick sort c) Merge sort d) Selection sort	L1	CO5
4C-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) $o(1)$	L1	CO5
4C-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 b) merge sort c) insertion sort	L1	CO5

	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
4F-1	----- Method is used to create an empty graph	L3	CO5
4F-2	----- Is an external sorting algorithm which makes a use of secondary storage	L3	CO5
4F-3	The best case time complexity of merge sort algorithm is -----	L2	CO5
4F-4	A pair of nodes connected by a line segment is called -----	L6	CO5
4F-5	The minimum number of vertices that a cyclic graph posses is -----	L3	CO5
4F-6	The standard graphs, traversals are -----	L3	CO5
4F-7	In an undirected graph, the sum of degrees of all the must be -----	L3	CO5
4F-8	Heap sort belongs to the family of sorting by -----	L2	CO5
4F-9	A----- can be used for multi-way merge	L3	CO5
4F-10	-----Algorithm design technique is used in the quick sort algorithm?	L3	CO5
4F-11	For merging two sorted lists of size m and n into sorted list of size m+n, we require comparisons of-----	L4	CO5
4F-12	A sorting technique is called stable if it-----	L3	CO5
4F-13	----- the worst method of choosing a pivot element.	L3	CO5
4F-14	Quick sort follows-----	L2	CO5
4F-15	The -----traversal of a graph traverses all decedents of a node before moving to an adjacent node	L3	CO5
	MATCHTHEFOLLOWING 1MARK QUESTIONS	BT Level	Course Outcome

4M-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	L1	CO5
4M-2	1. Merge sort 2. Heap sort 3. Quick sort 4. Insertion sort	a) sort small number of elements b) sort linked list c) information searching d) find smallest and largest number	L1	CO5
4M-3	1. Quick sort 2. Task scheduling 3. Merge sort 4. Prim's	a) divide and conquer algorithm b) greedy programming c) dynamic programming algorithm d) not stable algorithm	L1	CO5
4M-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	L1	CO5

PART B

5 MARKS QUESTIONS

4D-1	Write about various graph representation techniques?	L1	CO5
4D-2	Classify the types of graphs? Explain basic terminologies in graph?	L2	CO5
4D-3	Explain Breadth first search traversal with example?	L2	CO5
4D-4	Explain Depth first search traversal with example?	L2	CO5
4D-5	Write a program to implement breadth first search?	L3	CO5
4D-6	Write a program to implement depth first search?	L3	CO5
4D-7	Explain about heap sort with example?	L2	CO5
4D-8	Explain external sorting model for external sorting?	L2	CO5
4D-9	Discuss about merge sort technique with suitable example?	L2	CO5
4D-10	Explain about external sorting with an example.	L2	CO5
4D-11	Explain about quick sort technique with suitable example?	L2	CO5
4D-12	a) Distinguish between quick sort and merge sort? b) What are applications of quick sort and merge sort?	L4 L1	CO5
4D-13	Differentiate between BFS and DFS.	L4	CO5
4D-14	Write the advantages and disadvantages of quick sort	L1	CO5
4D-15	b) Distinguish between heap sort and merge sort? c) What are applications of heap sort and merge sort?	L4, L1	CO5

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

UNIT – V			
	OBJECTIVE TYPE QUESTIONS ½ MARK QUESTIONS	BT Level	Course Outcome
5C-1	Trie is also known as _____ a) Digital Tree b) Treap c) Binomial Tree d) 2-3 Tree	L1	CO6
5C-2	Which of the following special type of trie is used for fast searching of the full texts? a) Ctrie b) Hash tree c) Suffix tree d) T tree	L1	CO6
5C-3	Which of the following is true about the trie? 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	L1	CO6
5C-4	Auto complete and spell checkers can be implemented efficiently using the trie. a) True b) False	L3	CO6
5C-5	Which of the following is the fastest algorithm in string matching field? a) Boyer-Moore's algorithm b) String matching algorithm c) Quick search algorithm d) Linear search algorithm	L1	CO6
5C-6	Which of the following algorithms formed the basis for the Quick search algorithm? a) Boyer-Moore's algorithm b) Parallel string matching algorithm c) Binary Search algorithm d) Linear Search algorithm	L1	CO6
5C-7	Which of the following is the efficient data structure for searching words in dictionaries? a) BST b) Linked List c) Balanced BST d) Trie	L1	CO6
5C-8	What traversal over trie gives the lexicographical sorting of the set of the strings? a) postorder b) preorders c) inorder d) level order	L1	CO6
5C-9	What can be the maximum depth of the trie with n strings and m as the maximum string length? a) log ₂ n b) log ₂ m c) n d) m	L1	CO6
5C-10	A program to search a contact from phone directory can be implemented efficiently using a) a BST b) a trie c) a balanced BST d) a binary tree	L3	CO6

5C-11	What is the auxiliary space complexity of Z algorithm for pattern searching (m=length of text, n = length of pattern)? a) $O(n + m)$ b) $O(m)$ c) $O(n)$ d) $O(m * n)$	L1	CO6
5C-12	Which of the following is not true? 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	L1	CO6
5C-13	Which of the following is true about the trie? 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	L1	CO6
5C-14	Which of the following special type of trie is used for fast searching of the full texts? a) Ctrie b) Hash tree c) Suffix tree d) T tree	L1	CO6
5C-15	Auto complete and spell checkers can be implemented efficiently using the trie. a) True b) False	L3	CO6

	FILL IN THE BLANKS ½ MARK QUESTIONS	BT Level	Course Outcome
5F-1	-----function is used to prevent backtracking on a string.	L2	CO6
5F-2	The term trie is derived from the word -----	L1	CO6
5F-3	The number of nodes in a tree is -----	L1	CO6
5F-4	A standard trie has a binary structure when the alphabet has only ----- channels	L2	CO6
5F-5	-----structure is useful when the size of key values vary	L2	CO6
5F-6	-----support search, insert and delete operations in $O(d-m)$ time	L1	CO6
5F-7	-----eliminates the character of nodes	L1	CO6
5F-8	In-----method, traversal is started from a given vertex V in the graph	L2	CO6
5F-9	Heap can be classified as -----	L2	CO6

5F-10	Trie is also known as-----	L1	CO6
5F-11	A program to search a contact from phone directory can be implemented efficiently using -----	L3	CO6
5F-12	construction of suffix trie take-----	L6	CO6
5F-13	-----can be the maximum depth of the trie with n strings and m as the maximum string length	L4	CO6
5F-14	-----type of trie is used for fast searching of the full texts	L1	CO6
5F-15	-----structure is useful when the size of key values varies	L1	CO6
	MATCH THE FOLLOWING 1 MARK QUESTIONS	BT Level	Course Outcome
5C-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	CO6
5C-2	1. Pattern matching 2. Navi based algorithm 3. Boye moor algorithm 4. Knuth-morris pttern 5. Tries a) brute force algorithm b) search string notepad c) supports fast string matching d) backward approach e) compares character left -right	2	CO6
5C-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	CO6
5C-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	CO6
5C-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	CO6

PART B			
5 MARKS QUESTIONS			
5C-1	Discuss about various types of tries.	L2	CO6
5C-2	Write an algorithm of Standard Trie.	L1	CO6
5C-3	Write and explain Boyer Moore pattern matching algorithm?	L2	CO6

5C-4	Explain the features that distinguish between Boyer Moore algorithm from the conventional algorithms.	L2	CO6
5C-5	Write and explain Knuth-Morris-pratt pattern matching algorithm?	L2	CO6
5C-6	Discuss Knuth Morris Pratt (KMP) algorithm. Compute whether the pattern P=10100111 is present in the string T=1001010100111 or not.	L6	CO6
5C-7	What are the advantages of trie? Compare trie with Hash table?	L4	CO6
5C-8	Explain about the compressed trie with an example.	L2	CO6
5C-9	Calculate the failure function (or) prefix table in a search string “ABACAABADCABACABAABB”.	L5	CO6
5C-10	Differentiate standard tries and compressed tries?	L4	CO6
5C-11	Explain the Brute-force algorithm with an example	L2	CO6
5C-12	Explain about the Suffix tries with an example.	L2	CO6
5C-13	Write an algorithm of compressed trie	L4	CO6
5C-14	Write an algorithm of standard trie.	L4	CO6
5C-15	Draw the Standard Trie and Compressed Trie for the following String {area, array, aim, acid, act, rest, rate, ratio}	L6	CO6

	SRI INDU COLLEGE OF ENGG & TECH MODEL QUESTION PAPER (Regulation: R22) Department of AIML		(Regulation:R22)
	Sub. Code &Title	(R22CSE2112) DATASTRUCTURES	
	AcademicYear:2025-26	Year/Sem.	II-I / CSE(AIML)
	Faculty Name & Designation	Mr. B. Pavan Kumar, Assistant Professor	

DURATION: 2Hrs

Max Marks: 30M

PART – A

Answer ALL multiple choice questions.

10Q X ½ M=5M

- Which type of linked list stores the address of the first node in the next pointer of the lastnode? []
 - Singly Linked List
 - Doubly Linked List
 - Hashed List
 - Circular Linked List
- Which data structure is based on the Last In First Out (LIFO) principle? []
 - Tree
 - Linked List
 - Stack
 - Queue
- What is the time complexity to count the number of elements in the linked list? []
 - $O(1)$
 - $O(n)$
 - $O(\log n)$
 - $O(n^2)$
- What data organization method is used in hash tables? []
 - Stack
 - Array
 - Linked List
 - Queue
- What is a hash table? []
 - A structure that maps values to keys
 - A structure that maps keys to values
 - A structure used for storage
 - A structure used to implement stack and queue
- Which one of the following data structures are preferred in database-system implementation? []
 - AVL tree
 - B-tree

- c) B+ - tree
- d) Splay tree

7. When to choose Red-Black tree, AVL tree and B-trees? []
- a) many inserts, many searches and when managing more items respectively
 - b) many searches, when managing more items respectively and many inserts respectively
 - c) sorting, sorting and retrieval respectively
 - d) retrieval, sorting and retrieval respectively
8. 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
9. Descending priority queue can be implemented using _____ []
- a) max heap
 - b) min heap
 - c) min-max heap
 - d) trie
10. Which of the following is the fastest algorithm in string matching field? []
- a) Boyer-Moore's algorithm
 - b) String matching algorithm
 - c) Quick search algorithm
 - d) Linear search algorithm

II. Answer all fill in the blanks.

6Q X ½ M= 3M

11. Types of queues are -----
12. _____ allows direct access to the table.
13. _____ method of hash function depends upon the remainder of division.
14. If a node has K children in B tree, then the node contains exactly-----keys.
15. The standard graphs, traversals are -----
16. Heap can be classified as -----

III. Answer all the Match the following Questions.

2Q X 1M = 2M

17.

a. Queue	1. DFS
b. Tree	2. LIFO
c. Stack	3. Stack
d. Linear data structure	4. Non Linear data structure

18.

a. Suffix tries	1. used to activate space optimization
b. Standard tries	2. based on prefix of string
c. Compressed tries	3. faster insertion
d. Trie data structure	4. ordered tree data structure

PART B

Answer any FOUR Questions.

4QX5M = 20M

19. Discuss about implementation of linked list.
20. Write a program to implement stack using linked list.
21. Compare between Quadratic probing and Double Hashing.
22. Write list of operations perform on AVL tree with example?
23. Write a program to implement breadth first search?
24. Write and explain Boyer Moore pattern matching algorithm?

Part – A

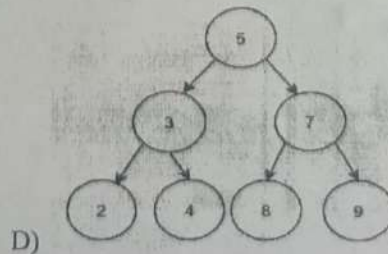
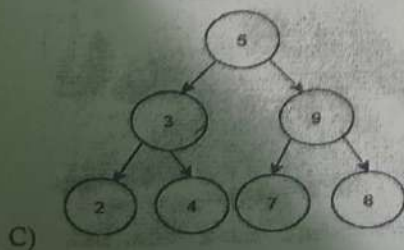
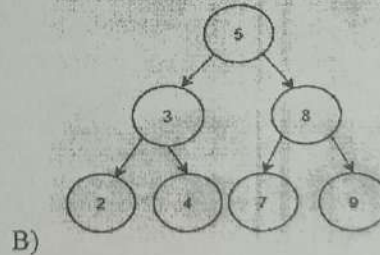
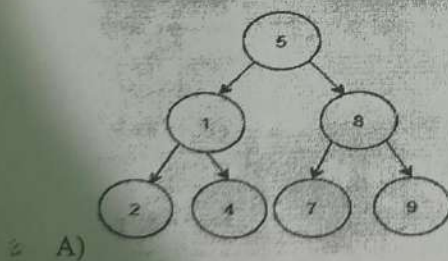
Answer All multiple choice questions.

Marks: 10Qx1/2M = 5M

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

Bloom's Taxonomy Levels	Course Outcomes
I	CO1

- | | | | |
|---|-------|----|-----|
| <p>1. What is a data structure?
 A) A programming language B) A collection of algorithms
 C) A way to store and organize data D) A type of computer hardware.</p> | [] | I | CO1 |
| <p>2. Which data structure is based on the Last In First Out (LIFO) principle?
 A) Tree B) Linked List C) Stack D) Queue.</p> | [] | I | CO1 |
| <p>3. Which data structure is needed to convert infix notation to postfix notation?
 A) Tree B) Branch C) Stack D) Queue.</p> | [] | I | CO1 |
| <p>4. What is the value of the postfix expression 6 324+ -*?
 A) 74 B) -18 C) 22 D) 40.</p> | [] | V | CO1 |
| <p>5. If the hash function is $h(\text{element}) = \text{element} \% 10$, so for which of the pair of values, the collision will take place.
 A) 15 and 14 B) 12 and 2 C) 1 and 10 D) 11 and 22.</p> | [] | I | CO1 |
| <p>6. Which of the following problems occur due to linear probing?
 A) Primary collision B) Secondary collision
 C) Separate chaining. D) Extendible Hashing.</p> | [] | I | CO2 |
| <p>7. What is a hash table?
 A) A structure that maps values to keys
 B) A structure that maps keys to values
 C) A structure used for storage
 D) A structure used to implement stack and queue.</p> | [] | II | CO2 |
| <p>8. Hashing technique which allocates fixed number of buckets is classified as.
 A) Dynamic hashing B) Static hashing C) External hashing D) internal hashing.</p> | [] | II | CO2 |
| <p>9. Which of the following traversal outputs the data in sorted order in a BST?
 A) Preorder B) Inorder C) Postorder D) Level order</p> | [] | I | CO3 |
| <p>10. Construct a binary search tree by using post order sequence given below.
 Post order: 2, 4, 3, 7, 9, 8, 5.</p> | [] | VI | CO3 |



P.T.O.

Answer All fill in the blank questions.

Marks: $6Q \times 1/2M = 3M$

11. _____ is the condition to become a queue full. IV CO1
12. _____ is the condition that specifies a queue contains single element. IV CO1
13. Applications of Queue are _____. II CO1
14. _____ using a secondary has function on the hash key on the item. II CO2
15. If h is a hash and key is a key, _____ is called the hash of key. III CO2
16. If a node has K children in B tree, then the node contains exactly _____ keys. I CO3

Answer All Match the following questions.

Marks: $2Q \times 1M = 2M$

17.

1. Linear data structures	a)	LIFO list
2. Stack	b)	Insertion and Deletion can be done from both ends
3. Applications of Stack	c)	Stack, Queue
4. De-queue	d)	Evaluating postfix expression
18.

1. Abstract data Type	a)	Rehashing
2. Open Hashing	b)	Dictionary
3. Increase and decrease in size	c)	Collision results in storing one of the records at another slot in the table
4. Closed Hashing	d)	Whether collisions are stored outside the table.

Part - B

Answer any FOUR questions.

Marks: $4Q \times 5M = 20M$

19. Discuss about implementation of single linked list. II CO1
20. Write a program to implement stack using Linked list. I CO1
21. Compare Single linked list with Double linked list. IV CO1
22. Explain how does collision occur. II CO2
23. Compare between Quadratic probing and double hashing. IV CO2
24. 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}. I CO3

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

1956

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

DATA STRUCTURES
(Common to CSE and IT)

10 /03/2021

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.
"AndroidOS10".

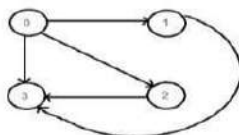
(OR)

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

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

(R18CSE2101) DATA STRUCTURES - (Common to CSE & IT)

Duration: 90Mins

Dt: 30.10.2019 AN

Max Marks:

25M

Section – A

Answer All the questions

Marks:

5Qx1M = 5M

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

Marks:

4Qx5M = 20M

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.



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II B.Tech. I Semester (SUPPL.) End Examinations, Aug./Sept. - 2022.

(R18CSE2101) DATA STRUCTURES

01/09/2022

(For CSE and IT)

Day- 2 (FN)

Duration: 3 Hrs

Maximum Marks: 70M

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

Course Outcomes : CO

Answer any FIVE questions from the following.

(5Qx14M = 70M)

1. Develop functions to insert and delete given element from the linked list. III CO1
2. What is Queue? Implement operations of Queue using arrays. II CO2
3. What is hash table? Develop functions for inserting and searching an element in Hash table. III CO1
4. Why and when double hashing and rehashing techniques are needed? Explain. V CO2
5. Discuss with examples how height is balanced in AVL trees. IV CO4
6. Write a algorithm for Merge Sort and derive its time complexity. II CO3
7. What is Tries? Implement find and insert operations on it. III CO6
8. a) Develop a function to count number of nodes in linked list. II CO4 (4M)
b) What is hashing? List types of hash functions. I CO1 (4M)
c) Define binary search tree, complete binary tree and full binary tree. IV CO2 (3M)
d) Define complete graph, null graph. II CO1 (3M)



Write Your Ht.No.

D4

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 (Suppl.) End Examinations, February – 2022.
(R18CSE2101) DATA STRUCTURES

(For CSE and IT)

03/03/2022

Duration: 3 Hrs

Day- 2 (FN)

Maximum Marks: 70M
Blooms Taxonomy : (L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating and L6-Creating)

Course Outcomes : CO

Answer any FIVE questions from the following.

(5Qx14M=70M)

1. What is linked list? Implement the insertion and deletion operation on linked list. L3 CO1
2. What is stack? Implement operations of Stack using arrays. L3 CO2
3. What is hashing? Discuss about various types of Hash functions. L1 CO1
4. Linear probing and Quadratic probing. L2 CO2
5. Write algorithms to perform deletion and insertion operations in AVL trees. L4 CO4
6. Discuss time complexity of Merge Sort for various cases. L5 CO3
7. Discuss Compressed Tries and Suffix tries. L2 CO6
8.
 - a) Compare Linked list and Array. L2 CO4 (4M)
 - b) Develop algorithm or function to find maximum element from binary search tree. L4 CO2 (4M)
 - c) Write Algorithm for DFS. L2 CO1 (3M)
 - d) What is Collision? List collision resolution techniques. L1 CO1 (3M)

**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

Dt: 26.08.2019 AN

Max Marks:

25M

Section – A

Answer All the questions

Marks:

5Qx1M = 5M

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

Marks:

4Qx5M = 20M

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 Liner 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.



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II B.Tech. I Semester (Suppl.) End Examinations, February – 2022.

(R18CSE2101) DATA STRUCTURES

(For CSE and IT)

Day- 2 (FN)

03/03/2022

Maximum Marks: 70M

Duration: 3 Hrs

Blooms Taxonomy : (L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating and L6-Creating)

Course Outcomes : CO

Answer any FIVE questions from the following.

(5Qx14M = 70M)

- | | | |
|--|----|----------|
| 1. What is linked list? Implement the insertion and deletion operation on linked list. | L3 | CO1 |
| 2. What is stack? Implement operations of Stack using arrays. | L3 | CO2 |
| 3. What is hashing? Discuss about various types of Hash functions. | L1 | CO1 |
| 4. Linear probing and Quadratic probing. | L2 | CO2 |
| 5. Write algorithms to perform deletion and insertion operations in AVL trees. | L4 | CO4 |
| 6. Discuss time complexity of Merge Sort for various cases. | L5 | CO3 |
| 7. Discuss Compressed Tries and Suffix tries. | L2 | CO6 |
| 8. a) Compare Linked list and Array. | L2 | CO4 (4M) |
| b) Develop algorithm or function to find maximum element from binary search tree. | L4 | CO2 (4M) |
| c) Write Algorithm for DFS. | L2 | CO1 (3M) |
| d) What is Collision? List collision resolution techniques. | L1 | CO1 (3M) |

BR-22

HT.No. D4
QC2591

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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II B.Tech. I Semester (REG & SUPPL) End Examinations, JANUARY- 2025.

(R22CSE2112) DATA STRUCTURES

03/01/2025 (For CSE, CS, AIML, AIDS, DS, IoT, CSIT & IT) Day-2(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) List various types of Data structures. | I CO1 |
| b) What are the applications of Queue? | I CO1 |
| c) Represent a linear list using an example. | I CO2 |
| d) What is Extendible hashing? | I CO2 |
| e) Represent the height of a AVL tree using an example. | III CO3 |
| f) Discuss about B ⁺ -Tree. | IV CO3 |
| g) List various Graph traversal methods. | I CO4 |
| h) What is External sorting? | I CO4 |
| i) Define Pattern matching. | I CO5 |
| j) Write about Suffix Tries. | I CO5 |

PART - B

Answer FIVE questions choosing at least one from each unit.

(5Qx10M=50M)

UNIT-I

- | | |
|---|--------|
| 2a. Explain Insertion, Deletion and Searching operations for single linked list using an example. | IV CO1 |
|---|--------|

(OR)

- | | |
|---|---------|
| 2b. Describe about Linked representation of stacks. | III CO1 |
|---|---------|

UNIT-II

- | | |
|---|--------|
| 3a. Explain about Open addressing and Linear probing. | II CO2 |
|---|--------|

(OR)

- | | |
|---|--------|
| 3b. Discuss about Skip list representation. | II CO2 |
|---|--------|

UNIT-III

- | | |
|---|---------|
| 4a. Define Binary Tree. List and explain various operations in Binary Tree. | III CO3 |
|---|---------|

(OR)

- | | |
|---|--------|
| 4b. Discuss various operations in AVL trees using an example. | VI CO3 |
|---|--------|

UNIT-IV

- | | |
|---|--------|
| 5a. Using an example describe about Merge sort in detail. | IV CO4 |
|---|--------|

(OR)

- | | |
|---|-------|
| 5b. Define Graph. Explain various implementation methods for Graph. | V CO4 |
|---|-------|

UNIT-V

- | | |
|---|--------|
| 6a. Write about Knuth-Morris-Pratt Algorithm. | VI CO5 |
|---|--------|

(OR)

- | | |
|---|---------|
| 6b. Explain about Brute force method in detail. | III CO5 |
|---|---------|
