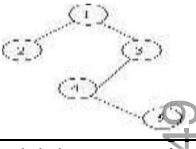
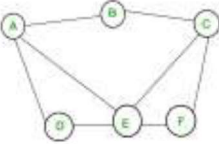


DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE			
Regular/Supplementary Winter Examination – 2024			
Course: B. Tech Branch: Computer Engineering/Computer Science and Engg(AI & ML) & Allied			
Subject Code & Name: Data Structures (BTCOC303)		Semester : III	
Max Marks: 60		Date:10/02/2025	
		Duration: 3 Hrs.	
Instructions to the Students: 1. Each question carries 12 marks. 2. Question No. 1 will be compulsory and include objective-type questions. 3. Candidates are required to attempt any four questions from Question No. 2 to Question No. 6. 4. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 5. Use of non-programmable scientific calculators is allowed. 6. Assume suitable data wherever necessary and mention it clearly.			
		(Level/ CO)	Marks
Q. 1	Objective type questions. (Compulsory Question)		12
1	Linked list is not suitable data structure for which one of the following problems? a) Insertion sort b) Binary search c) Radix sort d) Polynomial manipulation		1
2	A program P reads in 500 integers in the range $[0..100]$ representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for P to store the frequencies? a) An array of 50 numbers b) An array of 100 numbers c) An array of 500 numbers d) A dynamically allocated array of 550 numbers		1
3	You have to sort a list L consisting of a sorted list followed by a few random elements. Which of the following sorting methods would be especially suitable for such a task? a) Bubble sort b) Selection sort c) Quick sort d) Insertion sort		1
4	The number of interchanges required to sort 10, 6, 11, 7,		1

	9 in ascending order using bubble sort is a) 7 b) 5 c) 6 d) 8		
5	The number of element in an array $A[l1:u1, l2:u2]$ is given by a) $(u1-l1-1)(u2-l2-1)$ b) $(u1 \times u2)$ c) $(u1-l1)(u2-l2)$ d) $(u1-l1+1)(u2-l2+1)$		1
6	A situation where one wants to delete data from from a data structure that is empty. a) Free storage b) Underflow c) Overflow d) Compaction		1
7	Which of the following is/are application(s) of linked list? a) To implement file systems b) For separate chaining in hash-table c) To implement non-binary trees d) All of the mentioned		1
8	The matrix contains m rows and n columns. The matrix is called sparse matrix if a) Total number of Zero elements $> (m \times n)/2$ b) Total number of Zero elements $= m+n$ c) Total number of Zero elements $= m/n$ d) Total number of Zero elements $= m-n$		1
9	A binary tree with n nodes has <i>null</i> childrens? a) n b) $n+1$ c) $n/2$ d) n^2		1
10	The maximum number of edges in an undirected graph with n vertices is a) $n(n-1)/2$ b) 2^n c) $n!$ d) $(n-1)/2$		1
11	How many distinct binary search trees can be constructed with 3 distinct keys? a) 4 b) 5 c) 6 d) 9		1
12	The best data structure to check whether an arithmetic expression has balanced parenthesis is. a) Queue b) Stack c) Tree d) Linked list		1
Q. 2	Solve the following.		12
A)	Why <i>queue</i> is called abstract data type (ADT). Write an		6

	algorithm to implement <i>enqueue</i> and <i>dequeue</i> operations using array as data structure.		
B)	What is binary search tree (bst)? Construct <i>bst</i> for the following data items and show tree after each insert operation. 85, 40, 7, 55, 91, 89, 24		6
Q.3	Solve the following.		12
A)	Convert the infix expression $((A + B) * C - (D - E) ^ (F + G))$ to equivalent <i>Prefix</i> and <i>Postfix</i> notations using stack.		6
B)	Explain how to implement two stacks using one array $A[1..n]$ in such way that neither stack overflows unless the total number of elements in both stacks together is n . The <i>PUSH()</i> and <i>POP()</i> operations should run in $O(1)$ time.		6
Q.4	Solve Any Two of the following.		12
A)	What is hash data structure? Consider the Keys $(k) = \{25, 38, 41, 52, 3, 13, 56\}$ are inserted into an empty hash table using hash function $h(k) = (k \text{ mod } 7)$ and linear probing is used for collision resolution. Give content of the hash table after every key insertion.		6
B)	Consider insertion of characters into empty circular linked list A, B, C, D, E, F . Assume these elements are stored using 10 memory locations. Find the sequence of characters in the list. Suppose F and then C are deleted and G is inserted at the beginning of list. Find the final structure.		6
C)	What is linked list? Let <i>List</i> be a linked list in memory. Write a separate procedure for each of the following which: i) Finds the how many times a given <i>Item</i> occurs in the <i>List</i> . ii) Add a given value K to each Item in the List.		6

Q.5	Solve Any Two of the following.		12
A)	The inorder and preorder traversals of T yield the following: i) Inorder traversal: $E, A, C, K, F, H, D, B, G$ ii) Preorder traversal: $F, A, E, K, C, D, H, G, B$ Construct the original binary tree T using above two sequences.		6
B)	A scheme for storing binary trees in an array X is as follows. Indexing of an array start with 1. The root is stored at $X[1]$. For a node stored at $X[i]$, the left child is stored in $X[2i]$ and the right child is stored in $X[2i+1]$. Give the array representation of the below given tree. Also, in worst case to store any binary tree of n number of vertices, how many places do you need in array? 		6
C)	Write and explain bubble sort algorithm. Also, prove that the complexity of bubble sort is $O(n^2)$.		6
Q.6	Solve Any Two of the following.		12
A)	An array $A[1 \dots 5][1 \dots 5]$ is stored in the memory with each element requiring 4 bytes of storage. If the base address of array is 300, then determine the location of $A[3][4]$, if the array elements are stored (i) Row wise and (ii) Column wise.		6
B)	Enlist properties of the following trees. i) Red black tree iii) AVL tree iv) m-way search tree vi) b+ tree		6
C)	Consider the simple graph given below. Describe G formally in terms of its set V of nodes and its set E of edges. Also find the indegree, outdegree and total degree of each node.		6

		
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