

Reg. No.					

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DEPARTMENT OF SCIENCES, III SEMESTER- M.Sc APPLIED MATHEMATICS & COMPUTING, END SEMESTER EXAMINATIONS, November 2017 DATA STRUCTURES AND ALGORITHMS- MAT 703 (REVISED CREDIT SYSTEM)

Time:	: 3 Hours	Date: 17 NOV 2017	MAX. MARKS: 50					
Note:	(i) Answer any FIVE FULL questions.							
	(ii) Draw diagr	ams, and write equations wherever necessary.						
1A.	What is Running Time Analysis? Give a note on how to compare algorithms. (3)							
1 B .	Validate the	Validate the binary search tree sort algorithm with a suitable data set. (3)						
1C.	Write function to add and delete an item into a singly linked list at front end and							
	display the li	st.	(4)					
2A.	Define algori	thm. Explain the specifications of algorithms.	(3)					
2B.	Evaluate th	e following expression using stacks.						
		$1 - 4^{3} + 7 * (9^{1}/3)^{2} - 2$	(3)					
2C.	i. Write the e	xpression tree for + ^ * 3 4 6 ^ 2 ^ / 5 6 8	(2)					
	ii. Write recu	rrence relation for the following code.						
		<i>void function(int n)</i>						
		{						
		$if(n \le 1)$ return;						
		if (n > 1) (
		<i>print ("*")</i> ;						
		function $\left(\frac{n}{2}\right)$;						
		function $\left(\frac{n}{2}\right)$;						
		}	(2)					
		,	(-)					

3A. Quick-sort is run on two inputs shown below to sort in ascending order
(a) 1,2,3...,n & (b) n, n - 1, n - 2, ..., 2, 1.
Let C1 and C2 be the number of comparisons made for the inputs (a) and (b) respectively. Then which is true in the following statements and justify your answer.

(*i*)C1 > C2; (*ii*) C1 < C2; (*iii*) C1 = C2; (*iv*) We cannot say anything for arbitrary *n*. (3)

3B. Find the complexity of recurrence relation given below,

$$T(n) = \begin{cases} 2T(n-1) - 1, & \text{if } n > 0\\ 1, & \text{otherwise} \end{cases}$$
(3)

3C. Explain various binary tree traversal techniques with the help of tree in Fig.(a).



Fig.(a)

Fig.(b)

- 4A. Explain briefly traversing algorithms of a graph with reference to graph in Fig.(b). (3)
- 4B. Write a program to implement Stack operations using linked list. (3)
- 4C. (i) The inorder and preorder traversal of a binary tree are DBHEIAFCG and ABDEHICFG respectively. Write the binary tree structure and also write the postorder traversal of binary tree. (2)

(ii) We are given with a pointer to the first element of linked list L where multiple entries of an information is not allowed. There are two possibilities for L, it is either ends(snake) or its last element points back to one of the earlier elements in the list(snail). Give an algorithm that tests whether a given linked list is a snake or a snail.

(4)

- 5A. Given N distinct points in the XY-plane, and the problem is to find out the closest pair of points. For Example, given with (0, 0), (1, 1), (-2,0), (-2, 2), (3, 3), (5,2) in XY plane, solution is closest pair of points among this are (0,0) and (1,1). For this problem which algorithm design approach would help, justify your answer.
- 5B. Illustrate the working of heap sort technique with an example. (3)
- 5C. Define minimum spanning tree. Describe any Kruskal's algorithm for finding the minimum cost spanning tree with respect to graph in Fig.(c). (4)



- 6A. What is Dijkstras algorithm for finding the shortest path? Describe its working with respect to the following graph in Fig(d). (4)
- 6B. Given a chain of four matrices $A_1(5 * 4)$, $A_2(4 * 6)$, $A_3(6 * 2)$ and $A_4(2 * 7)$. Determine the multiplication sequence that minimizes the number of scalar multiplications in computing $A_1 * A_2 * A_3 * A_4$. (4)
- 6C. Write a brief note on advantages and disadvantages of linked lists. (2)

***All the best ***