Exam.Code:0915
Sub. Code: 6391

2074

B.E. (Computer Science and Engineering)

Third Semester

CS-301: Data Structures

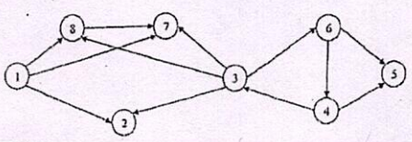
Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. 1 (Section-A) which is compulsory and selecting two questions each from Section B-C.

x-x-x

	Section-A	

1.	a) Write time complexity for following code:
	for (i=1;i<=n; i++)
	for (j=1,j<=n; j=j+i)
	print(a)
	b) Consider two algorithms A and B. Algorithm A has worst case running time of O(n) and Algorithm B has worst case running time of O(logn). Can we say that Algorithm B always runs faster that the Algorithm B.
	c) Consider usual implementation of parentheses balancing program using stack. What is the maximum number of parentheses that will appear on stack at any instance of time during analysis of (( ) (( )) (( )))?
	d) Define Linear open addressing.
	e) Differentiate between Kruskal's and Prims algorithm for finding the minimum spanning tree of a graph.
		10

	Section-B	
2.	**a) Give the complexity (Big 0) of the following, with small explanations:-** i. Adding an element to the front of a linked list ii. Finding an element in a sorted array iii. Finding an element in an unsorted array iv. Sorting n items by divide and conquer-Merge sort v. Shortest path between two nodes vi. The Tower of Hanoi problem vii. Quick Sort viii. Sum of elements of linear array ix) Inserting an element at the end of the single linked list. x) Inserting an element at the end of the doubly linked list.	10
3.	a) Convert the pre-fix expression to in-fix i) –* + ABC* – DE + FG ii) (A + B)*C – (D – E)*(F + G) b) Suppose you are given an implementation of a queue of integers. The operations that can be performed on the queue are: i. isEmpty (Q) — returns true if the queue is empty, false otherwise. ii. delete (Q) — deletes the element at the front of the queue and returns its value. iii. insert (Q, i) — inserts the integer i at the rear of the queue. Consider the given function: What operation is performed by the above function f ()? Justify with help of suitable example. `void f (queue Q) { int i ; if (!isEmpty(Q)) { i = delete(Q); f(Q); insert(Q, i); } }`	5 5
4.	a) In modified quick sort, the pivot is chosen as the median of three elements: the first, middle, and last elements of the array. You are given the following array to sort using the modified quicksort **Input array: [13, 5, 21, 2, 6, 8, 15, 25, 4, 17]** Sort the array with quick sort using this new selection rule. b) Consider the worst case of a merge sort algorithm as 30 seconds for an input of size 64. Calculate the approximate maximum input size of a problem that can be solved in 6 minutes?	6 4
	Section-C	
5.	a) Build a max-heap with 9 elements: A, B, C, D, E, F, G, H, and I. Illustrate the steps b) Explain with help of suitable diagram linked and sequential implementation of Binary trees.	5 5
6.	a) Draw a Binary Search Tree (**BST**) by sequentially inserting the following elements: 71,82,76,61,66,72,74,111, 60 and 63 (b) Delete **76** from the **BST** obtained in **Q.6.(a)** and draw the resultant **BST**. c) Difference between B-Trees and B+ Trees	4 3 3
7.	a) Consider a hash table of size 8 and a corresponding hash function. Compute the locations to which the keys 14, 19, 13, 4, 5, 23, 6, and 15 are mapped using linear probing collision resolution technique. Draw the resultant hash table and determine the total number of collisions occurs. b) Apply BFS and DFS on directed graph given in following Fig. using vertex 3 as source showing all intermediate steps. 	5 5

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