Nirma University

Institute of Technology

Semester End Examination (RPR), December - 2018

B. Tech. in Computer Engineering, Semester-IV

CE403 Data Structures

Roll / Exam No. _____ Supervisor's Initial with Date _____

Time: 3 Hours Max Marks: 100

Instructions:
1. Attempt all questions of Section I and II separately in same Answerbook.
2. Figure to right indicate full marks
3. Assume suitable assumptions if required and specify them

Section - I

Q-1 Answer the following. **[15]**

A) Assume that each element of an array 'A' stored in row-major order occupies four bytes of memory. If 'A' is declared as: int A[3:10,1:15, 5:20] and base address of 'A' is 500, find the address of the array element A[5][10][8]. Consider the dimensions of given array as A[Row, Column, Depth]. **03**

B) a) Represent the following polynomial equation using best suitable data structure. $3x^5yz^2+4x^4y+6x^2z+5$ **04**

b) Compare linear and binary search technique with respect to time complexity.

C) Write an algorithm to perform insert and delete operations on priority queue. Use singly linked list to implement priority queue. **08**

OR

C) Write an algorithm to perform insertion sort on singly linked list without changing addresses of nodes in existing linked list. **08**

Q-2 Answer the following. **[15]**

A) Write an algorithm to perform insertion and deletion operation in simple queue implemented using linked list. **07**

B) Convert the given Infix expression into Prefix expression using Stack. Show the details of Stack at each step of conversion. **08**
K+L-M*N+(O^P)*W/U/V*T+Q where ^ indicates exponent operator.

Q-3 Answer the following. **[18]**

A) Write an algorithm to concatenate two circular doubly linked lists A and B, such that list B appears after list A and the resultant list would also be a circular doubly linked list. **06**

B) Discuss first-fit, best-fit and worst-fit storage allocation strategies. **06**

C) A collision will occur when two or more keys are assigned the same location in hashing technique. Suggest suitable methods to resolve collision problem in hashing. **06**

Section II

Q-4 Answer the following. **[18]**

A) Create a Binary Search Tree (BST) by inserting following list of integers in order of their occurrence. **07**

67, 78, 65, 74, 55, 66, 89, 95, 82, 45, 60, 72, 76

From the resultant BST, delete the following elements 66, 55, 78. Show all intermediate steps after each insertion and deletion operation.

OR

A) Sort the following data in ascending order using Quick sort. Choose middle element as pivot element in each partition. Write the resulting array after each partition. 24, 56, 47, 35, 10, 90, 82, 31 **07**

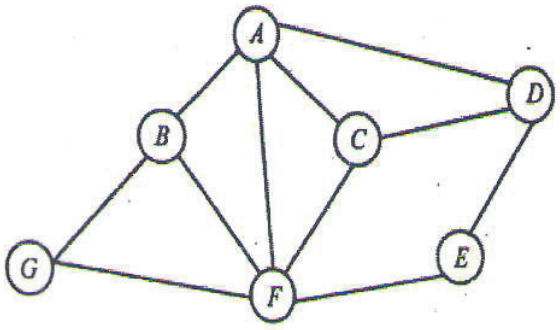
Describe the behavior of Quick sort when the input is already sorted.

B) A student has been given a linked list to sort. Which algorithm he/she should prefer for sorting that linked list, so that it results in less space and time complexity - quick sort or merge sort? Justify your answer. Also analyze time complexity of your algorithm. **06**

C) Construct a Min-Heap Tree from the set S= {18, 4, 7, 1, 9, 15, 16, 28, 20, 36}. Show all the intermediate steps. **05**

Q-5 Answer the following. **[16]**

A) Give the adjacency matrix representation of following graph. Also traverse the graph using Breadth First Search (BFS) algorithm and give the traversing sequence. Start traversing from vertex A. Show all the intermediate steps. **06**



B) Draw an AVL tree by inserting following list of integers in order of their occurrence. **10**

50, 25, 10, 5, 7, 3, 30, 20, 8, 15.

Delete 10, 3, 30, and 20 from resultant AVL tree.

Show all intermediate steps after each insertion and deletion operation.

OR

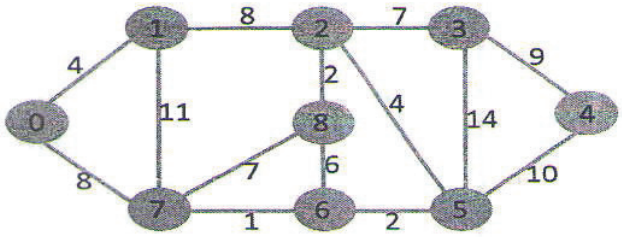
B) Draw B-tree of order 5 by inserting following list of integers in order of their occurrence. **10**

1, 10, 11, 4, 5, 3, 14, 16, 20, 21, 26, 2, 3, 7, 15, 22, 17, 18, 19, 23, 25.
Delete 6, 13, 7, 4, and 2 from resultant B-tree.
Show all intermediate steps after each insertion and deletion operation.

Q-6 Answer the following. **[18]**

A) Write a recursive algorithm to solve Tower of Hanoi problem. Show the stack tracing of algorithm to solve 4-disk Tower of Hanoi problem. **08**

B) Construct minimum spanning tree from below given graph using Kruskal's algorithm. Show all intermediate steps. **06**



C) The Inorder and Preorder traversal of a tree are given below: **04**
Inorder : D B M I N E A F C J G K
Preorder : A B D E I M N C F G J K
(i) Draw the corresponding Binary Tree.
(ii) Give the postorder traversal of tree drawn.