NIRMA UNIVERSITY

Institute of Technology

Semester End Examination (IR), May-2018

B. Tech. in Computer Engineering/Information Technology, Semester – IV

CE403 – Data Structures

Roll / Exam No.		Supervisor's Initial with Date	

Time: 3 Hours   Max Marks: 100

Instructions: 1. Attempt all questions.
   2. Figure to right indicate full marks
   3. Assume suitable assumptions if required and specify them.

Q-1   Answer the following.   [16]

A) Assume that each element of an array 'A' stored in row-major order   **04**
occupies four bytes of memory. If 'A' is declared as: int A[-2:7, 3:22, 1:5] and base address of 'A' is 2000, find the address of an array element A[5][12][4]. Consider the dimensions of given array as A[Row, Column, Depth].

B) Sort the following data set in ascending order using Radix sort. Show   **04**
the tracing steps.

1243, 4, 54, 887, 996, 25, 56, 737, 7, 89, 111, 28

C) Write an algorithm to evaluate a postfix expression. Trace the   **08**
algorithm to evaluate the following postfix expression.
A B + C D / A D - E A ∧ + * +
where A=2, B=7, C=9, D=3, E=5 and ∧ indicates exponent operator.

OR

C) Create a Binary Search Tree (BST) by inserting following list of integers   **08**
in order of their occurrence.

65, 76, 63, 72, 53, 64, 87, 93, 80, 43, 58, 70, 74

From the resultant BST, delete the elements 64, 53, 76, 74. Show all intermediate steps after each insertion and deletion operation.

Q-2   Answer the following.   [16]

A) Write an algorithm to insert an elements at rear end and front end in   **08**
circular double ended queue.

B) Given a linked list and two integers X and Y. Write an algorithm to   **08**
traverse the linked list such that you retain X nodes then delete next Y nodes, continue the same until end of the linked list. For example, if Input: X=2, Y=2, Linked list: 11 ->12 ->13 ->14 ->15 ->16 ->17 ->18, Output linked list: 11 ->12 ->15 ->16.

Q-3   Answer the following.   [18]

A) Draw B-tree of order 3 by inserting following list of integers in order of   **06**
their occurrence.

10, 24, 23, 11, 31, 16, 26, 35, 29, 20, 46, 28, 13, 27, 33, 21
Show all intermediate steps after each insertion operation.

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

C) A queue Q containing n items and an empty stack S are given. It is   **06**
required to transfer all the items from the queue to the stack, so that
the item at the front of the queue is on the top of the stack, and the
order of all the other items is preserved. Show how this can be done in
O(n) time using only a constant amount of additional storage. Note
that the only operations which can be performed on the queue and
stack are Delete, Insert, Push and Pop. Do not assume any
implementation of the queue or stack.

Q-4   Answer the following.   [16]

A) Draw a threaded binary tree of below given binary tree as per Inorder   **08**
traversal. Write an algorithm for finding Inorder successor and Inorder
predecessor of any given node in threaded binary tree.
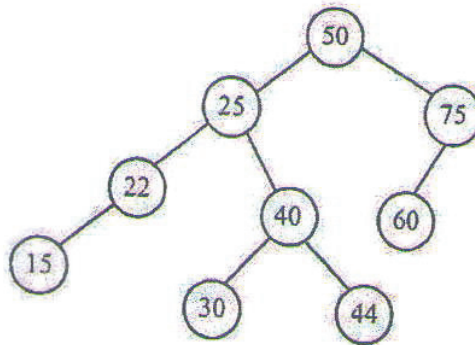
OR

A) Draw the graph represented by given adjacency matrix. Traverse the   **08**
obtained graph using Depth First Search (DFS) algorithm and give the
traversing sequence. Start traversing from vertex 'a'. Show all the
intermediate steps.

	a	b	c	d	e
a	1	0	1	0	1
b	0	0	1	1	0
c	1	1	0	0	0
d	0	1	0	0	1
e	1	0	0	1	0

B) The Inorder and Preorder traversal of a tree are given below: **04**
Inorder : E A C K F H O B G,   Preorder : F A E K C O H G B

(i) Draw the corresponding Binary Tree.
(ii) Give the postorder traversal of tree drawn.

C) a) Which of the following sorting algorithm is the least dependent on the initial ordering of the input given. Justify your answer. **04**

(i) Merge sort   (ii) Quick sort
(iii) Insertion sort   (iv) Selection sort

b) Given two sorted list of size m and n respectively. In worst case, how many comparisons would be required for merging these two list. Explain your answer.

(i) m*n   (ii) Maximum of m and n
(iii) Minimum of m and n   (iv) m+n-1

Q-5 Answer the following.   **[18]**

A) A linked list is said to have a loop, if last node points to any other node of the same linked list instead of pointing to NULL. Write an algorithm to find and remove the loop in a singly linked list. **10**

OR

A) Write an algorithm to insert and delete a node in the beginning and end in a circular doubly linked list. **10**

B) Convert the given Infix expression into Prefix expression using Stack. Show the details of Stack at each step of conversion. **08**
R/D-Y*(G/C*(D-E)+B/Z)+S*A

Q-6 Answer the following.   **[16]**

A) Construct minimum spanning tree from below given graph using Prim's algorithm. Show all the intermediate steps. **06**
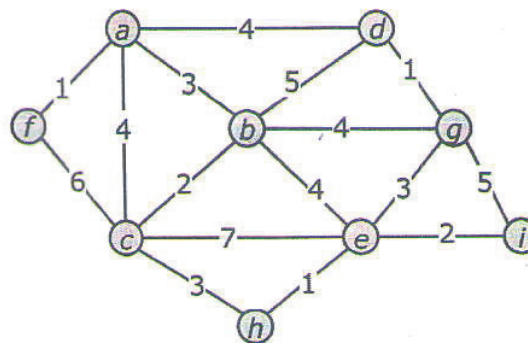
B) Sort the elements of set S={5, 13, 17, 10, 84, 19, 6, 22, 9} in ascending order using heap sort. Show all the intermediate steps. **06**

C) The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. Show all the intermediate steps and display resultant hash table. **04**