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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent Institution of MAHE, Manipal)

VII SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)
MAKE-UP EXAMINATIONS, DECEMBER 2018
SUBJECT: DATA STRUCTURES & ALGORITHM [ELE 4018]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 27, December 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. A square matrix is called symmetric if for all values of **i** and **j**, $a[i][j] = a[j][i]$. Write an algorithm, with detailed comments, which verifies whether a given 5 x 5 matrix is symmetric. ***(03)***

1B. Let there be a single linked list whose address of the first node is stored in LIST. Write an algorithm, with detailed comments, which has 2 subroutines to perform the following operations:

a) One finds the number of times (say, NUM) a given item (say, ITEM) occurs in LIST.
b) Other finds the number of nonzero elements (say, NONZERO) in LIST. ***(04)***

1C. Write a procedure, with detailed comments, to delete a node from a double linked list if the key (say, KEY) is found. ***(03)***

2A. Represent the arithmetic expression $P = ((A + ((B\hat{}C) - D)) * (E - (A/C)))$ in prefix and postfix notations. ***(03)***

2B. A function, InfixToPostfix(), converts the infix expression given above in Q. 2A into postfix notation using a stack. The function performs push and pop operations on the stack by calling PUSH() & POP() subroutines respectively. Write the procedure for InfixToPostfix(). The stack is implemented using an array. ***(05)***

2C. Consider the following queue of characters, where QUEUE is a circular array which is allocated 6 memory cells:

FRONT = 2 REAR = 4

↓ ↓

QUEUE:		A	C	D		

What will be FRONT and REAR values & QUEUE elements after each of the following operations?

a)	F is added to the queue	c)	K, L & M are added to the queue
b)	2 letters are deleted	d)	2 letters are deleted

(02)

3A. The inorder and preorder traversals of a binary tree are shown in the table below. Construct the binary tree.

Inorder	D	B	H	E	A	I	F	J	C	G
Preorder	A	B	D	E	H	C	F	I	J	G

(02)

3B. Write an algorithm with detailed comments to insert an element in a given max heap tree. Assume that the heap is implemented using array. ***(04)***

3C. Explain the breadth first search (BFS) traversal for the graph shown in Fig. 3C below. ***(04)***

4A. Write a pseudo-code with detailed comments for sorting an array of integers using the technique of quick-sort. ***(04)***

4B. Construct the binary search tree from the given preorder traversal {10, 5, 1, 7, 40, 50} ***(02)***

4C. For merge sort algorithm do the time complexity analysis. ***(04)***

5A. Following is the incidence matrix ***I*** where the rows represent vertices and the columns represent edges and $a_{ij} = 1$ if j^{th} edge is incident to the i^{th} vertex of an undirected graph of 5 vertices and 8 edges. Draw the graph and obtain its adjacency matrix.

$$I = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$

(02)

5B. Write a pseudo-code with detailed comments to insert a vertex between 3rd and 4th vertices in the matrix representation of the graph obtained in Q.5A. ***(03)***

5C. Write an algorithm with detailed comments to sort an array of integers using merge-sort. ***(05)***

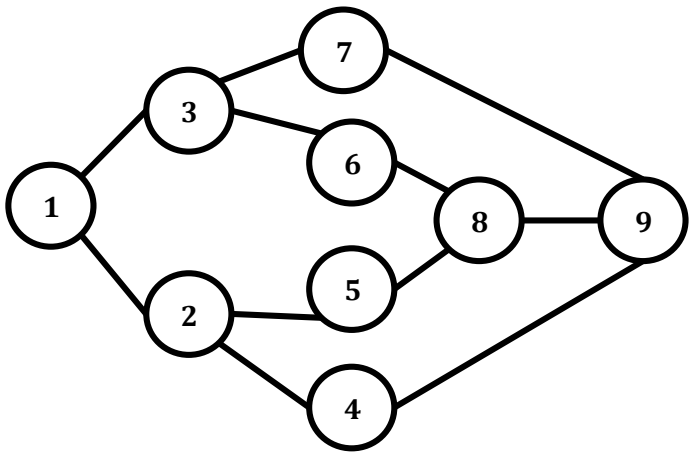

Fig. 3C