P-1488

[6002]-115

S.E. (E & TC/Electronics)
DATA STRUCTURES
## (2019 Pattern) (Semester - III) (204184)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right indicate full marks.*
3) *Assume suitable data, if necessary.*

Q1) a) Write a 'C' Function to Push and POP elements from a stack of characters using an array. **[6]**

b) Convert the following infix expression to postfix using stack (show all the steps properly) : a + b*(c/d$ a)/b **[5]**

c) Consider Following circular queue of characters and size 5. **[6]**

		A	C	
		↑	↑	
		Front	Rear	
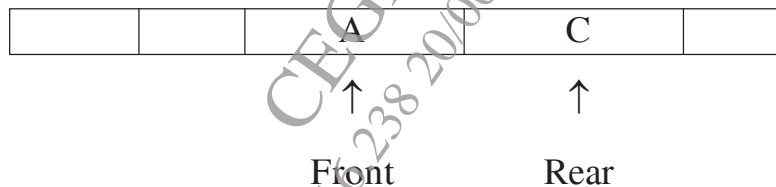
Front point to A and Rear Points to C. Show the circular queue contents as per the following operations at every step.

i) F is added to the queue.

ii) Two letters are deleted.

iii) K, L, M are added to the queue

iv) Two letters are deleted.

v) R is added to the queue.

vi) Two letters are deleted.

OR

Q2) a) Compare Stack and Queue. **[4]**

b) What are the applications of Stack.

Represent stack for decimal to binary conversion: $(56)_{10}$ to $(---)2$ **[3]**

c) Define Queue. What are conditions for 'Queue empty' and 'Queue full' when queue is implemented using Array? Explain. **[6]**

d) Write a 'C' function for deletion in a queue using an array. **[4]**

Q3) a) Compare circular linked list with singly linked list in terms of pros and cons. **[6]**

b) What is a singly linked list? Write C function for inserting a node at a given location into a singly linked list. **[6]**

c) Explain the disadvantages of polynomial representation using an array. Represent the following polynomial using a singly linked list. **[6]**

$23x^9 + 18x^7 + 41x^6 + 16x^4 + 3$

OR

Q4) a) What is a doubly linked list? Write a 'C' function for Inserting a number at the end of the doubly linked list. **[6]**

b) Write a 'C' function for Inserting a number at the front of the circular linked list. **[5]**

c) Compare linked representation and array representation with reference to the following aspects : **[3]**

   i) Accessing any element randomly

   ii) Insertion & deletion of an element

   iii) Utilization of memory

d) Write a short note on the Circular Linked list. **[4]**

Q5) a) Define the following terms with respect to Trees : **[5]**

   i) Root

   ii) Subtree

   iii) Level of node

   iv) Depth of Tree

   v) Siblings

b) Write a recursive 'C' function for inorder, preorder, postorder tree traversal? **[6]**

c) Construct the Binary Search Tree (BST) from the following data : **[6]**

5, 2, 8, 4, 1, 9, 7

Also show preorder, postorder and inorder traversal for the same.

<center>OR</center>

Q6) a) Define a tree. Explain with a suitable example how a binary tree can be represented using an array. **[5]**

b) Write an algorithm to implement non-recursive in-order traversal of a binary search tree. **[6]**

c) The postorder and inorder traversals of a binary tree are given below. Is it possible to obtain a unique binary tree from these traversals? If yes, obtain the tree, if not give justification. **[6]**

Inorder Traversal : D B F E G A H I C

Postorder Traversal : D F G E B I H C A

Q7) a) Define Graph. Explain types of Graph. **[6]**

b) Compare DFS and BPS. **[6]**

c) Find the minimal spanning tree of the following graph using Prim's algorithm. Show all the steps. **[6]**
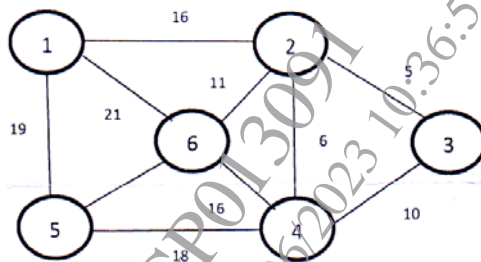

<center>**Fig : 1**</center>

Q8) a) Define with an example : **[6]**

    i) Path

    ii) Cycle

    iii) Connected graph

b) Define indegree and outdegree of a vertex in graph. Find the indegree and outdegree of following graph. **[6]**
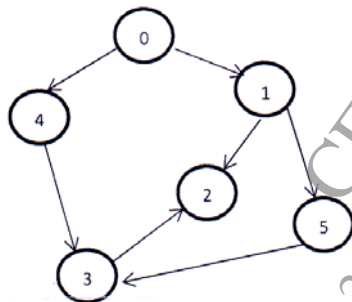

<center>**Fig : 2**</center>

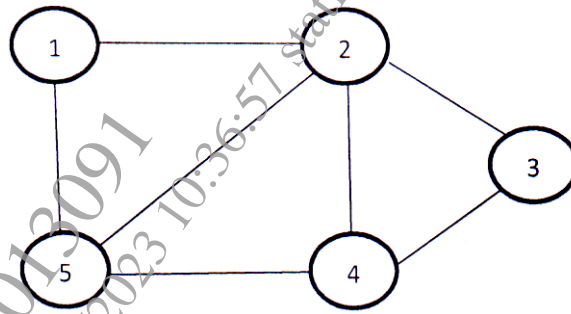c) Represent the following graph using the adjacency matrix and adjacency list. **[6]**

Fig : 3

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