Total No. of Questions : 8]

SEAT No. :

PB3653

[Total No. of Pages : 4

[6261]-61
S.E. (I.T.)
DATA STRUCTURES AND ALGORITHMS
(2019 Pattern) (Semester - III) (214443)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Imagine we have two empty stacks of integers, S1 and S2. Draw a picture of each stack after the following operations: **[6]**

i) S1. Push (3);
ii) S1. Push (5);
iii) S1. Push (7);
iv) S1. Push (9);
v) S1. Push (11);
vi) S1. Push (13);
vii) while (! Emptystack (S1))
{
X = S1. Pop ();
X = S1. Pop ();
S2. Push (X);
}

b) Clearly indicate the content of stack during conversion of given infix expression to prefix.

A^B*C–D+E/F/(G+H) **[6]**

c) Write a C++ pseudocode algorithm for the following operation of simple queue using linked representation. **[6]**

i) enqueue ()
ii) dequeue()
iii) print_Queue()

OR

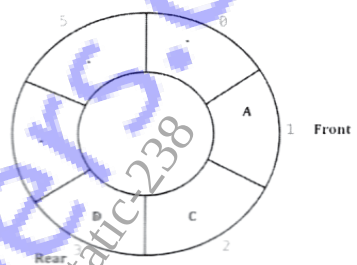
P.T.O.

Q2) a) If the values of A, B, C, and D are 2, 3, 4, and 5 respectively. Calculate the value of the following prefix expression and clearly indicate the content of stack. **(Consider '_' as a minus sign)** **[6]**

i) + – * A B C D

ii) – * A + B C D

b) Consider the following **circular queue of characters of size 6.** "_" denotes an empty queue location. Initial queue configuration is Front = 1, Rear = 3 and having letters as shown below. **[6]**



i) F is added to the queue

ii) Two letters are deleted

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

iv) R is added to the queue

v) Two letters are deleted

vi) S is added to the queue

vii) Two letters are deleted

Show the queue content of queue with Front and Rear as the above options take place.

c) What is double ended queue? Mention Types of double ended queue. Explain enqueue and dequeue operations of double ended queue. **[6]**

Q3) a) Create a binary tree from given preorder and inorder traversal. **Show all intermediate steps.** **[6]**

Preorder : G B Q A C K F P D E R H

Inorder : Q B K C F A G P E D H R

b) Write the C++ pseudocode algorithm for creating expression tree from postfix expression. **[6]**

c) Construct an inorder threaded binary search tree for the following set of elements. **[5]**

100, 50, 200, 300, 20, 150, 70, 180, 120, 30

Show all steps.

OR

Q4) a) Write C++ pseudocode algorithm for preorder traversal of threaded binary tree. **[6]**

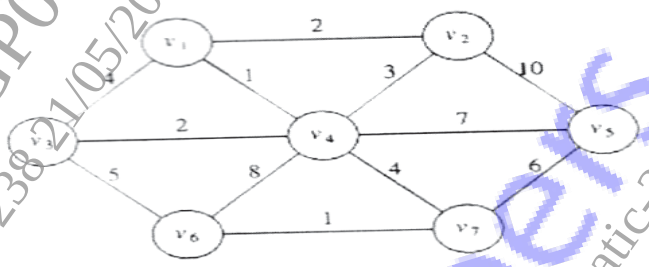
b) Draw the expression tree for the given postfix expression. Clearly indicate the content of stack. Write the inorder and preorder traversal of the concern tree. **[6]**

A B C * + E * F +

c) Explain the following terms with respect to tree. **[5]**

i) Root
ii) Leaf node
iii) Siblings
iv) Degree of a node
v) Degree of tree

Q5) a) Find the minimum spanning tree using Prim's algorithm for the following graph. **[6]**



b) Obtain an AVL tree by inserting one data element at a time in the following sequence: **[7]**

50, 55, 60, 15, 10, 40, 20, 45, 30, 70, 80.

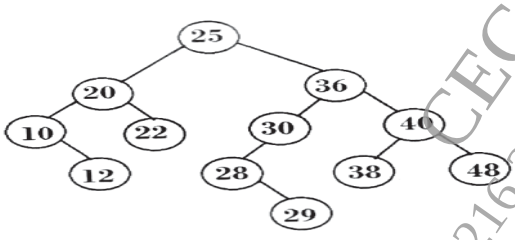
Label the rotations appropriately at each stage

c) Write short note on OBST. **[5]**

OR

Q6) a) Write an application of Topological sorting with suitable example. **[6]**

b) For a given tree, Identify whether it is AVL tree or not? If it is not an AVL tree, convert it into balanced AVL tree. After conversion, insert node 15 in the tree. Delete node 20 from the tree. After insertion and deletion operation, if the tree is imbalanced, make it balanced AVL tree. **[7]**



c) Construct Heap to Sort given values in ascending order using MAXheap sort, 5, 3, 17, 10, 84, 19, 22. **[5]**

(Note : Make a use of Heapify)

Q7) a) Differentiate between sequential file and direct access file. **[6]**

b) Write a pseudo code to perform the following operations on Sequential file : **[6]**

i) Insert record

ii) Delete record

c) What are the characteristics of good hash function? List different techniques to resolve collision in hash table and explain any one with suitable example. **[5]**

OR

Q8) a) Explain the Index sequential file organization with advantages and disadvantage. **[6]**

b) Explain Linear probing with and without replacement with suitable examples. **[6]**

c) What is File? Differentiate between text file and binary file. **[5]**

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