Your Roll No................

Sr. No. of Question Paper : 734   I

Unique Paper Code   : 6202452301

Name of the Paper   : Data Structures

Name of the Course   : **Bachelors of Vocation ((Software Development) IT/ITES)**

Semester   : III

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The paper has **two** sections. **Section A** is compulsory. Each question is of **6** marks.

3. Attempt any **four** questions from **Section B**. Each question is of **15** marks.

Section A

1. Write a short note with an example for each of the following :

(a) Heap sort (6)

(b) List representation of stack (6)

(c) Doubly linked list (6)

(d) Linear and non-linear data structures (6)

(e) Complete and almost complete Binary trees (6)

Section B

2. (a) Write a recursive algorithm to calculate the factorial of a given number. (7)

(b) Describe the structural characteristics of a binary tree. Construct a Binary tree having a degree 2 with a minimum of five levels. (8)

3. (a) Evaluate the following postfix expression :

17 15 * 60 3 / + 8 – (4)

(b) Convert the following arithmetic expression using stack from infix to prefix :

Q: (W + A) * (M + K) (5)

(c) List the steps for converting an infix expression to a postfix expression using stacks. Demonstrate using an example. (6)

4. (a) What are the necessary and essential conditions for a *Tower of Hanoi* game. Write a python program to solve the recursive *Tower of Hanoi* problem with multiple disks? (7)

(b) Determine the array-based sequential representation of the following binary tree :

(8)
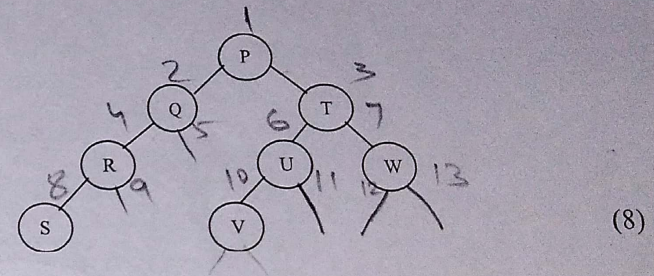
5. (a) Define priority queue and illustrate its important characteristics. Write a program to add elements in a priority queue. (7)

(b) Write an algorithm for the following :

(i) Display all the nodes of doubly linked list

(ii) Insert a node at the beginning of a circular linked list

(iii) Display all the nodes of a circular linked list

P.T.O

(iv) Delete a node at any given point in a singly linked list

(8)

6 (a) Write the key differences between max-heap and min heap. Construct a min heap H and show heap after each insertion using the following elements :

36, 65, 98, 72, 29, 189

(7)

(b) Insert the keys 1, 5, 14, 4, 35, 6, 18, 22, and 10 into a hash table of size m=10 using linear probing and hash function $H(i) = i \bmod 10$.

(8)

7 (a) Construct a binary tree with the following traversal:

Preorder: A B E D F C G H I J K L

Inorder: D B F E A G C I H K J L

(5)

(b) Insert the following elements into an empty B tree of order 5 :

4, 12, 14, 1, 2, 3, 18, 20, 17, 16, 27, 23, 21, 11, 30, 33, 28, 29, 13

(10)