B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

00556

Term-End Examination

December, 2014

BICS-007 : DATA STRUCTURES

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** out of ten questions. All questions carry equal marks.*

1. (a)   Consider the following multidimensional arrays :

   X(– 5:5, 3:33), X(3:10, 1:15, 10:20).

   Find the length of each dimension and the number of elements in X and Y. Suppose Base (Y) = 400 and there are w = 4 words per memory location. Find the effective indices E_1, E_2, E_3 and the address of Y[5, 10, 15] assuming Y is stored in row major order.   6

   (b)   Define Time Complexity. Explain Big Oh (O) notation.   4

2. (a) Write a program to construct and delete elements in a circular queue using link list. *6*

(b) Translate the following infix expression into its equivalent postfix expression : *4*

$$((A + B) | D) \uparrow ((E - F) * G)$$

3. (a) A binary tree has 9 nodes. The inorder and preorder traversal of T yield the following sequences of nodes :

Inorder   E, A, C, K, F, H, D, B, G

Preorder   F, A, E, K, C, D, H, G, B

Draw the tree T. *5*

(b) Draw all possible non-similar trees T, where : *5*

(i) T is a binary tree with three nodes.

(ii) T is a 2-tree with four external nodes.

4. (a) Write a short note on Garbage Collection and Compaction. *5*

(b) Write a program to delete a node in a doubly linked list. *5*

5. (a) Draw the binary search tree that results from inserting into an initially empty tree records with keys given below in order E, A, S, Y, Q, U, E, S, T, I, O, N and then deleting the Q. *6*

(b) What is a threaded binary tree ? Explain with the help of an example. What are its advantages ? *4*

6. (a) Write a program to sort an array of elements using quick sort algorithm. **7**

   (b) What are the applications of stack ? **3**

7. (a) What is a hash function ? Explain different kinds of hash functions. **5**

   (b) Consider the directed graph G :
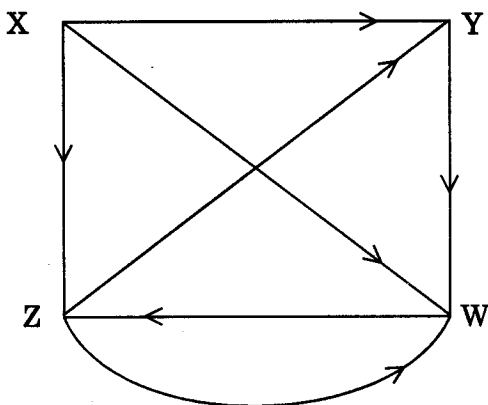
   Find : **5**

   (i) the adjacency matrix A of the graph G.

   (ii) the path matrix P of G using powers of adjacency matrix A.

8. (a) Write an algorithm to insert and delete an element in a given array. **5**

   (b) Write a program to delete the last node from a given linked list. **5**

9. (a) Suppose T is a binary tree. Write a recursive procedure which finds the number NUM of nodes in T. *5*

(b) Explain Breadth First Search Algorithm. *5*

10. Write short notes on any *two* of the following : *2×5=10*

(a) Comparison of Indexing and Hashing

(b) Huffman's Algorithm

(c) Spanning Trees