(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 7306 Roll No. | | | | | | | | | | |

M.C.A.

(SEM II) EVEN SEMESTER THEORY EXAMINATION, 2009-2010

DATA STRUCTURES USING C

Time : 3 Hours *Total Marks : 100*

Note : *(i) This paper is in three sections. Section-A carries 20 marks, Section-B carries 30 marks and Section-C carries 50 marks.*

(ii) Attempt all questions. Marks are indicated against each questions/parts.

(iii) Assume data where required.

SECTION - A

1. You are required to answer all the parts of this question. **(10x2=20)**

Choose the correct answer for parts (a) to (d) :

(a) The complexity of Binary Search is given by :

(i) $\log_2 n$

(ii) $\log_n 2$

(iii) $n\log_2 n$

(iv) none of the above

(b) A linear list in which the elements can be added or removed at either end but not in the middle, is called :

(i) Queue

(ii) Circular queue

(iii) Priority queue

(iv) Deque

(c) *O(n log n)* is the worst case complexity for :

(i) Quick sort

(ii) Bubble sort

(iii) Merge sort

(iv) None of the above

(d) In a complete binary tree of depth d, the number of leaf nodes is :

(i) $2^d - 1$

(ii) 2^d

(iii) $2^d + 1$

(iv) $2^{d+1} - 1$

State **TRUE** or **FALSE** for the parts (e) to (g).

(e) In stack insertions and deletion can take place only at one end.

(f) The binary tree is also called B-tree.

(g) A graph with one cycle is also called a tree.

Fill in the **BLANKS** for parts (h) to (j).

(h) The binary search is used to find an element from a given _____ list.

(i) _____ Traversal of Binary search tree gives sorted sequence.

(j) Warshall's algorithm is used to find _____ .

SECTION - B

2. Attempt **any three** parts of the following : **(3x10=30)**

(a) Define stack with suitable example. Implement a stack in C in which each item on the stack is a varying number of integers. Choose a C data structure for such a stack and design *push* and *pop* functions for it.

(b) Write an algorithm and a function addint *(p, q)* in C to add two long positive integers represented by singly linked circular lists.

(c) Explain B+ trees giving some of its applications. Also explain the algorithm to add and delete an element to B+ tree with suitable example.

(d) Describe various representations of graph.

(e) Write short notes on the following :

(i) Preorder traversal of tree.

(ii) Removal of recursion.

SECTION - C

3. Attempt **any two** parts of the following : **(2x5=10)**

(a) What do you mean by Binary Search Tree (BST) ? Discuss the insertion and deletion algorithm for BST with suitable example.

(b) Describe the evaluation of postfix notation using stack with example giving the algorithm for the same.

(c) Write a program in C to create a database of student of your class using structure. Make suitable assumptions yourself.

4 Attempt **any two** parts of the following : **(2x5=10)**

(a) Give the practical consideration for internal sorting. Also write a program in C to sort the given array of positive integers using bubble sort.

(b) Given an integer k, write a function in C programming language, which deletes the k^{th} element from a two-way circular header list. Make suitable assumption yourself.

(c) Discuss the following :

(i) Hash function and Hash table implementation.

(ii) Priority Queues.

5. Attempt **any two** parts of the following . **(2x5=10)**

(a) Define multi-way search tree. Also write an algorithm to delete a record from a top-down multi-way search tree of order n.

(b) Write an algorithm for a routine *merge* (*x, lb1, ub1, ub2*) that assumes that *x[lb1]* through *x[ub1]*, and *x[ub1 + 1]* through *x[ub2]* are sorted and merges the two into *x[lb1]* through *x[ub2]*.

(c) Explain the various steps of Quick sort algorithm with suitable example of at least 10 elements.

6. Attempt any two parts of the following : (2x5=10)

(a) What do you mean by file organization ? Describe various file organization with examples.

(b) Develop an algorithm using a heap of k elements to find the largest k numbers in a large, unsorted file of n numbers.

(c) Write a short note on Huffman algorithm explaining various steps with example.

7. Write short notes on **any four** of the following : (4x2.5=10)

(a) Spanning tree.

(b) Adjacency matrices

(c) Pointer arithmetic in C

(d) AVL trees.

(e) Algorithm complexity.

(f) Overflow and underflow in linked lists.

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