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NMCA213

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

PAPER ID : 214220

Roll No.

MCA
(SEM. II) THEORY EXAM. 2014-15
DATA STRUCTURES USING 'C'

Time : 3 Hours]   [Total Marks : 100

Note : Attempt the questions as indicated.

Q1. Attempt any *four* questions from the following :   5x4=20

(a) Consider the following C code segment :

```
int IsPrime(m)

    {

            int i, m;

            for (i = 2; i <= sqrt (m); i++)
```

is $(m \% i == 0)$

$\qquad$ {printf("Not Prime\n");

$\qquad$ return 0;}

$\quad$ return 1;

$\quad$ }

Let T(m) denote the number of times the *for* loop is executed by the program on input m. Find the complexity of the code.

(b) Suppose multidimensional arrays A and B are declared using

$\quad$ A (-2:2, 2:22) and B (1:8, -5:5, -10:5)

Consider the element B (3, 3, 3) in B. Find the effective indices E_1, E_2, E_3 and the address of the element, assuming Base (B) = 400 and there are w = 4 words per memory location.

(d) Write a function in C to find the largest element in an array.

(e) Translate the following infix expression into its equivalent postfix expression by showing all steps

$(A - B) / ((D + E) * F)$

(f) Define recursion. What is the complexity of the following recursive function? Int DoSomething (int n) {

    If (n <= 2)

        return 1;

    else

    return (DoSomething (floor (sqrt (n))) +n);

}

Q2. Attempt any *four* questions from the following : 5x4=20

(a) Describe the three types of structures used for storing strings.

(b) Is it possible to implement a queue with the help of two stacks? Explain.

(c) What do you mean by circular queue? How is it different from a simple queue? Show how an element is deleted from a circular queue.

(d) Write a C function to delete the kth elelment from a linked list, where k is an integer.

(e) Why is it more difficult to move backward than forward in a linked list?

(f) What do you mean by doubly-linked list? Explain with an example.

Q3. Attempt any *two* questions from the following : 10x2=20

(a) Define the terms binary tree, complete binary tree and threaded binary tree. Also give an example of each.

(b) Name the three conditions under which sequential search of a list is perferable to binary search. Why was binary search implemented only for contiguous lists, not for linked lists?

(c) What is Hash function? Name three techniques often built into Hash functions. Name four advantages of a chained Hash table over open addressing.

Q5. Attempt any *two* questions from the following :   10x2=20

(a) How many comparison of keys are required to verify that a list of *n* entries is in order? When are simple sorting algorithms better than sophisticated ones? Explain.

(b) What is a heap? How does heapsort work? Sort the following seven numbers into increasing order using heapsort.

12, 19, 33, 26, 29, 35, 22

(c) Define a B tree. Construct a B tree of order 3 by inserting following keys in the order shown into an empty B tree.

M   Q   A   N   P   W   X   T   G   E   J

Q5. Attempt any *two* questions from the following :   10x2=20

(a)   What is the difference between an undirected graph and directed graph? Describe the different ways to implement graphs in computer memory.

(b)   Define spanning tree of a graph. What is minimum spanning tree? Discuss any one method for finding the minimum spanning tree of a graph.

(c)   Write short notes on the following :

   i) Sparse matrices

   ii) Indexing of files

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