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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++)
```

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[Contd...

```
is (m % i == 0)
```

```
{printf("Not Prime\n");
```

```
return 0;}
```

```
return 1;
```

```
}
```

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

$A(-2:2, 2:22)$  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  $\text{Base}(B) = 400$  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  $k^{\text{th}}$  element 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 :  $10 \times 2 = 20$

- (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 preferable 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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