MCA 1st Semester Examination, 2010

INTRODUCTION TO PROGRAMMING LANGUAGE & DATA STRUCTURE

PAPER—CS/MCA-1101

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP—A

Answer **Q. No. 1** and any **three** from the rest

1. (*a*) What is the difference between these two declarations? 1

```
Struct x1 { ... };
typedef struct { ... } x2;
```

(*b*) What is pointer? How is a pointer initialized? Distinguish between (*m)[5] and *m [5].

2. (*a*) What are the advantages of switch over if-else statements?

(*b*) What is the purpose of (any *five*):

(*i*) Strcpy ( )

(*ii*) fopen ( )

(*iii*) rewind ( )

(*iv*) main ( )

(*v*) calloc ( )

(*vi*) # define ( )

(*c*) Write a program that will check whether given string is palindrome or not.

3. (*a*) Character strings in C are automatically terminated by the null character. Explain how this feature helps in string manipulations.

(*b*) Write a program to do the following : 7

(*i*) To output the question
"Who is the inventor of C ?"

(*ii*) To accept the answer

(*iii*) To print out "Good" and then stop, if the answer is correct.

(*iv*) To output the message "try again", if the answer is wrong.

(*v*) To display the correct answer when the answer is wrong even at the third attempt and stop.

4. (*a*) What is the advantage of using files in C ? 1

(*b*) Differentiate between call by value and call by reference. 3

(*c*) What is recursion ? Write a program that will find the factorial of a number using recursion. 1 + 5

5. (*a*) Determine the output of the following program : 3

```
main ( )
 {
   int  x = 10,  y = 20;
   int  p, q ;
   p = prod (x, y);
   q = prod (p,  prod (x, 2));
   printf ("%d %d", p, q);
 }
 prod (a, b)
 {
  int  a, b
  return (a * b);
 }
```

(*b*) Explain what is likely to happen when the data type of one of the actual arguments does not match with the data type of the corresponding formal argument and same variable name is declared in two different functions. Write a function space (*x*) that can be used to provide space between two output numbers. 3 + 4

6. (*a*) What is a structure ? How does it differ from an array and a union ? 1 + 2

(*b*) Define a structure called student that will describe the following information :

roll, name and marks.

Using student declare an array 'mca' with 50 elements. Write a program that will read the information about all the 50 students and list them rankwise. 7

GROUP – B

Answer **Q. No. 1** and any **two** from the rest

1. What is a linked list ? With the aid of algorithms discuss how a node can be inserted and deleted from a linked list. 1 + 4

2. (*a*) Suppose T is the binary tree stored in memory as shown is figure below.

ROOT
5

9
AVAIL

No.	Info	Left	Right
1	20	0	0
2	30	1	13
3	40	0	0
4	50	0	0
5	60	2	6
6	70	0	8
7	80	0	0
8	90	7	14
9		10	
10		0	
11	35	0	12
12	45	3	4
13	55	11	0
14	95	0	0

Draw the diagram of T. 3

(*b*) What is a heap? Write a program to sort an array of integers using the heap sort method. Show the steps to sort the following elements :

25, 57, 48, 37, 12, 92, 86 and 33. 2 + 6 + 4

3. (*a*) What are the advantages of circular queue over single queue? 4

(*b*) Write an algorithm to insert an element in to a circular queue. 5

(*c*) Prove that the maximum no. of nodes at level i in a binary tree is 2^{i-1} where $i >= 1$. What is extended binary tree? 5 + 1

4. (*a*) What do you mean by traversal? Briefly explain the four different traversals of binary tree. 1 + 4

(*b*) What is an expression tree? Draw the expression tree for : $A - B * C + D$. 1 + 2

(*c*) What is hashing? Briefly describe different types of hash functions. 2 + 3

(*d*) Draw all possible non-similar trees *T*, where *T* is a binary tree with three nodes.

5. (*a*) A circular queue has a size of 5 and has elements 10, 40 and 20 where Front = 2 and Rear = 4. After inserting 50 and 60, what is the value of Front and Rear. Trying to insert 30 at this stage what will happen ? Delete two elements from the queue and insert 100. Show the sequence of steps with necessary diagram with the value of Front and Rear.

(*b*) Explain "Interpolation Search" with a example. In which situations binary search is superior to interpolation search.

[*Internal Assessment* : 30 Marks]