RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR B.A./B.SC. THIRD SEMESTER (July – December) 2014 Mid-Semester Examination, September 2014

Date : 15/09/2014

COMPUTER SCIENCE (Honours) Paper : III

Time : 2 pm – 4 pm

Full Marks : 50

[3]

[2]

[2]

[3]

[Use a separate answer book for each group]

<u>Group – A</u>

(Answer any two questions)

		.10.	
1.	a)	If $A_i = [0,i]$, where $i \in \mathbb{Z}$, the set of integers, find—i) $A_1 \cup A_2$ and ii) $\bigcup A_i$.	[1+1]
		i=5	

- b) In how many ways can seven persons sit around a table so that all shall not have the same neighbours in any two arrangement?
- 2. a) For non-empty sets A and B prove that A B = B' A'.
 - b) Find a recurrence relation and give initial conditions for the number of bit strings of length n, that do not contain the pattern 11. [3]
- 3. a) Find the co-efficient of $x^2y^3z^2$ in $(x+y+z)^{10}$.
 - b) Check whether the poset $(Z^+, /)$ is lattice or not.

<u>Group – B</u>

(Answer <u>any one</u> question)

4.	a)	Prove that the number of odd degree vertices in a graph is always even.	[3]
	b)	Define Cut vertex, Bridge and Cut set with example.	[3]
	c)	How many Hamiltonian cycles are there in a complete graph of n vertices where $n \ge 3$? Justify your answer.	[2]
	d)	How many simple graphs can be constructed with n number of vertices? Justify your answer.	[2]
5.	a)	Prove that a tree with n vertices has n—1 edges.	[2]
	b)	Define walk, trail, path with example.	[3]
	c)	What is minimum spanning tree? Write an algorithm to find the minimum spanning tree for a	
		connected weighted graph. Explain the algorithm with an example.	[1+3]
	d)	For what values of n does the complete graph on n vertices, K _n , have an Euler cycle and why?	[1]

<u>Group – C</u>

(Answer <u>any one</u> question)

6. a) What do you mean by virtual base class? State its significance. [2+2]
b) Let 'Boo' be a class whose objects are created in the following fashion : Boo obj1 (10); Boo obj2 (obj1); Boo obj3 = obj1; Boo obj4; obj4 = obj3;

		For the above code sequence, explain when copy constructor & assignment operation	or
		overloading will call? Can copy constructor accept an object of the same class as parameter	er,
		instead of reference of the object?	[3+1]
	c)	Explain the major drawbacks of multiple inheritance.	[3]
	d)	Why Base class constructor is invoked at first when an object of derived class is created?	[2]
	e)	Describe "Friend Class" as a bridge.	[2]
7.	a)	Explain the 'ISA' and 'HAS A' class relationship with suitable illustration.	[4]
	b)	What do you mean by pure virtual destructor? How does it differ from pure virtual function	n?
		How do you know that your class needs a virtual destructor?	[2+2+2]
	c)	What will happen if you make a call "delete this" within a class member function?	[2]
	d)	Compare & contrast between function overloading & function overriding.	[3]

<u>Group – D</u>

8.	Write a recursive algorithm to find the height of a binary tree.	[5]
	Or,	
	How do you verify whether a binary tree is a binary search tree or not? Write an algorithm for the verification.	[5]
9.	Given two values k1 and k2 (where k1 < k2) and a root pointer to a Binary Search Tree. Write an algorithm to print all the keys of the tree in range k1 to k2. i.e. print all x such that k1 < x < k2.	[5]
10		

10. Consider the following code snippet in C. The function print () receives root of a Binary Search Tree (BST) and a positive integer k as arguments.

```
/*BinarySearchTree node */
strict node {
    int data;
    struct node *left, *right;
};
int count = 0;
void print(struct node *root, int k)
{
    if (root !-NULL && count <= k)
    {
         print (root->right, k);
         count++;
         if (count == k)
             printf("%d", root->data)'
         print(root->left, k);
    }
```

- }
- a) What is the output of *print* (*root*, 3) where root represents root of the following BST.
- b) In general, what the function is doing?



[5]