(Please write your Exam Roll No.) *Exam Roll No. ……………………*

End Term Examination

First Semester [MCA] December-2012

Paper Code: MCA 105	*Subject: Discrete Mathematics*

Time: 3 Hours **Maximum Marks: 60**

Note: Attempt any five questions including Q. no. 1 which is compulsory.
Select one question from each Unit.

Q1 Answer the following: - **(2 x 10 = 20)**

a) Prove that a tree with n vertices has n-1 edges.

b) Show that (a-c) ∩(c-b) =Φ, without using Venn diagrams. Where A, B, C are non-empty sets.

c) State Fermat's little theorem.

d) What is the coefficient of X^8y^9 in the expansion of $(3x+2y)^{17}$?

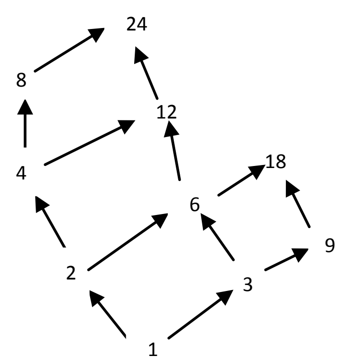
e) Give an example of graph having Hamiltonian circuit but not an Eulerian circuit.

f) If R and S are relations from A to B such that R__ S then prove that R^{-1} __ S^{-1} .

g) Prove that in an undirected graph numbers of odd degree vertices are even.

h) Prove or disprove that A U B is a group, where A and B are groups.

i) Does the following hasse diagram represent a lattice? Give reason.



j) How many solutions are there for the equation X+Y+Z=17, where X, Y, Z are non negative integers?

Unit -1

Q2. (a) Find the conclusion for the following hypothesis:- **(5)**

It is not sunny this afternoon and it is colder than yesterday

We will go swimming, only if it is sunny

If we do not go swimming, then we will take a canoe trip

If we take a canoe trip, then we will be home by sunset.

(b) Use mathematical induction to show that $H_{2^n} \geq 1 +$ – whenever n is a nonnegative integer.

Where H_j – – – **(5)**

Q3. (a)Let A be a set with n elements, find how many relations on A are there which (i) symmetric and (ii) anti-symmetric? **(4)**

(b) How many integers must you pick in order to be sure that at least two of them have the same remainder when divided by 7? **(3)**

(c) Use proof by cases to show that, where x and y are real numbers. **(3)**

Unit -2

Q4. (a) Show that every finite lattice has a least upper bound and a greatest lower bound. **(5)**

(b) Simplify the Boolean function F(a, b, c, d) = (0,1,2,3,4,5,7,6,8,9,11). **(5)**

Q5. (a) Minimize the following sum of product expansion: $xy\bar{z} + x\overline{yz} + \overline{xy}z + \overline{xyz}$. **(5)**

(b) Find the solution of the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$. Find $n \geq 2$. **(5)**

Unit- 3

Q6. (a) State and Prove Lagrange's Theorem for groups. **(5)**

(b) Find the code words generated by the parity-check matrix given below **(5)**

Q7. (a) Show that if a, b are arbitrary elements if a group G, then $(ab)^2 = a^2 b^2$ if G is abelian. **(5)**

(b) Explain Euclidean algorithm to find the gcd of two no's by taking example. **(5)**

Unit -4

Q8. (a)Let G be a connected planar simple graph with E is number of edges and V is number of vertices and R is a number of regions then V-E+R = 2. **(5)**

(b) State and prove five-color theorem for graphs. **(5)**

Q9. (a) Write a short note on Seven Bridge Problem of graph theory. **(5)**

(b) Define pre order and post order traversal of a tree. Determine the order in which a preorder and post order traversal visits the vertices of the following ordered rooted tree. **(5)**