# END TERM EXAMINATION

**FIRST SEMESTER [MCA] DECEMBER 2013**

**Paper Code: MCA105** **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. Attempt **any ten** of the following: [10 x 2=20]

a) How many diagonals are there in a regular decagon.
b) Prove that p -> ( p v q ) is a tautology.
c) The set P( {a,b,c } ) is partially ordered with respect to the subset relation. Find a chain of length 3 in P.
d) Find the solution of recurrence relation $a_n=3a_{n-1}+1$ where $a_0=1$.
e) Prove that if gcd (a,b)=1 then gcd $(a^2,b^2)=1$.
f) Consider (m,3m) encoding function , where m=4. For received word 011010011111 an error will occur or not.
g) Give 2 ways to represent a graph in computer.
h) Define hamiltonian graph with example.
i) Show that any subgroup of a cyclic group is cyclic.
j) Show that if any 5 numbers from 1 to 8 are chosen , then two of them will add up to 9.
k) How many ways are there to arrange 7 –sign and 5 +sign , such that no two +sign are together.

## UNIT –I

Q2. a) knight is a person who always tell truth and knave always lie.We have two people A and B such that

A says “B is a Knight”, B says “the two of us are opposite”

What are A and B ? [3]

b) Let Z be the set of all integers and R be a relation defined on Z such that for any a,b Ɛ Z ,aRb if and only if ab≥ 0.Is R an equivalence relation ? [4]

c) Show that a set of n elements can have $2^n$ subsets. [3]

Q3.a) Prove that |xy|=|x||y| is true for all real numbers x and y. [3]

b) Define function. Find the inverse of $f(n)=2(x-2)^2+3$ for all $x \leq 2$. [4]

c) Find the number of integers between 1 and 100 that are divisible by any of the integer 2,3,5,7. [3]

**UNIT –II**

Q4.a) solve the difference equation

$a_r-5a_{r-1}+6a_{r-2}=2^r+r$ for $r \geq 2$ with the boundary conditions $a_0=1$ and $a_1=1$. [5]

b) let $L_1$ be the lattice $D_6$(divisor of 6)={1,2,3,6} and let $L_2$ be the lattice ( P(S), $\subseteq$) where S={a,b}.Show that two lattices are isomorphic. [5]

Q5.a) simplify $y=\sum m(0,1,2,3,4,6,8,9,10,11,12,14)$ using K-map. [5]

b) Compute f(n) when $n=2^k$ , where f satisfies the recurrence relation $f(n)=8f(n/2)+n^2$ with f(1)=1. [5]

**UNIT –III**

Q6.a) Let (G,*) be a group. Let H={a: a ЄG and a*b=b*a for all bЄG}.

Show that H is a normal subgroup. [5]

b) Is 8792002627912 a valid universal code. Explain. [3]

c) Solve 34x=60(mod98) [2]

Q7.a) A code G contains 16 code words: 0000000, 1111111, 1101000 and all it's cyclic shifts , 0010111 and all it's cyclic shifts. show that (G, ) is a group code. Set up the coset table to show that G can correct all single transmission errors. [5]

b) Encrypt the word 'BOOK' and 'PARK' using ceaser cipher system

f(p)=p+3(mod26). [5]

## UNIT –IV

Q8.a) Define Eulerian graph. Prove that a non empty connected graph is eulerian if and only if it's vertices are all of even degree. [4]

b) Differentiate between [3*2=6]

i. Graph and Tree
ii. Sub graphs and isomorphic graph
iii. Connected and complete graph

Q9.a) Prove that a planar graph G is 5 colorable. [5]

b)Explain inorder, preorder and postorder tree traversals with the help of an example. [5]