Reg.No.:______________

Department of Computer Science & Engineering
Motilal Nehru National Institute of Technology, Allahabad.
****End Sem. Examination (ODD-Semester) 2016-17****
Class: MCA Ist Semester 2016-2017
Subject: Foundation of Logic Code: (CA3104)

M.M.:60 Marks **M.Hrs: 3 Hrs.**

Instructions: 1) Write (precise /to the point) answers.
2) All questions are compulsory.
3) Assume and state suitable assumptions wherever necessary.

Q1.

a. Consider the statement which have premises and the conclusion. Find out whether the premises are able to prove the conclusion by using truth table. [4]
"If horses fly or cows eat grass then the mosquito is the national bird. If the mosquito is the national bird then peanut butter tastes good on hot dogs. But peanut tastes terrible on hot dogs. Therefore cows don't eat grass"

b. Use quantifier and predicate with more than one variable to express these statement. [3]
i. Every computer science students need a course in discrete mathematics.
ii. There is a student in this class who owns a personal computer.

c. Find the truth value of $[p\rightarrow(q\wedge(\neg r))\vee s] \wedge[(\neg t)\leftrightarrow(s\wedge r)]$ where t is false and p, q, r and s are true [3]

Q2.

a. Let $f: X\rightarrow Y$ be an everywhere define invertible function and A and B be arbitrary non empty subsets for Y such that : [4]
i. $f^{-1}(A\cup B) = f^{-1}(A)\cup f^{-1}(B)$
ii. $f^{-1}(A\cap B) = f^{-1}(A)\cap f^{-1}(B)$

b. Consider the following relation on set A={1,2,3,4,5,6,} R={(i,j) : |i-j|=2}. Is R is reflexive, symmetric or transitive? [3]

c. if R be the relation in the set of integer Z defined by R={(x, y) : x ∈Z, y∈Z x-y is divisible by 3} Derive the distinct equivalence classes of R. [3]

Q3.

a. Find the group of symmetrices of equilateral triangle. [4]
b. State and Prove the Lagrange's theorem. [3]
c. If in a group G, the elements a and b commutate, then prove that [3]
a. $a^{-1} * b^{-1} = b^{-1} * a^{-1}$ b. $a^{-1} * b = b * a^{-1}$

Q4.

a. Answer these question for the poset ({{1},{2},{4}, {1,2}, {1,4}, {2,4}, {3,4}, {1,3,4}, {2,3,4}}, ⊆). [4]
i. Find all upper bound of {{2}, {4}}.
ii. Find the greatest lower bound of {{1,3,4},{2,3,4}} if it exists. {1,2}
iii. Find the maximal element. {1,3,4} {2,3,4}
iv. Find the minimal element. {1}

b. Scheduled the tasks needed to build a house, by specifying their order, if the hasse diagram representing these tasks is as shown in the figure1. [3]

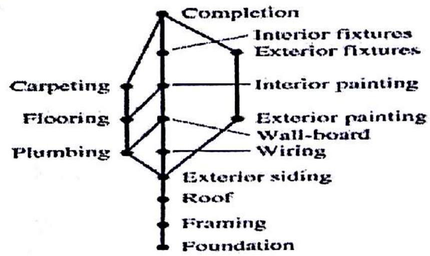

Figure 1

c. Determine whether the poset with these Hasse diagram are lattice from the figure2. [3]

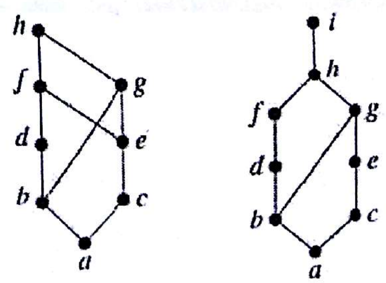

Figure 2

Q5.

a. Solve the recurrence relation by the method of generating function.
$a_r - 7a_{r-1} + 10a_{r-2} = 3^r$ $r\geq 2$
with the boundary condition $a_0=0$ and $a_1=1$. [4]

b. It is given that white tiger population of Orissa is 30 at time n=0 and 32 at time n=1.Also the increase from n-1 to time n is twice the increase from time n-2 to n-1. Write recurrence relation for growth rate of tiger and solve it. [3]

c. Solve the recurrence relation by the method of characteristic root [3]
$Y_{n+2} - Y_{n+1} - 2 Y_n = n^2$

Q6. Write short notes on the following. [10]
a) Monoid with example.
b) Integral domain with example.
c) Topological sorting with example.
d) Contradiction with example.