[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

14844

MCA 2nd Semester Examination

Discrete Mathematics (N.S.)

MCA-203

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all selecting one question from each of Sections A, B, C and D. Question no. 9 in Section E is compulsory.

SECTION - A

1. (a) Show that $\sim(pV(\sim p \Lambda q)$ and $\sim p \Lambda \sim q$ are logically equivalent, where ~p is the negation of p. (6)

   (b) Define tautology. Show that $(p \Lambda q) \rightarrow (pVq)$ is a tautology. (6)

2. (a) Define principal conjunctive normal form. Obtain the principal conjunctive normal form of $(p \Lambda q)V(\sim p \Lambda r)$ (6)

   (b) Prove that the argument given below is a valid argument

$$\begin{array}{l} p \rightarrow (q \rightarrow r) \\ \sim q \rightarrow \sim p \\ p \\ \hline \therefore r \end{array}$$

(6)

SECTION - B

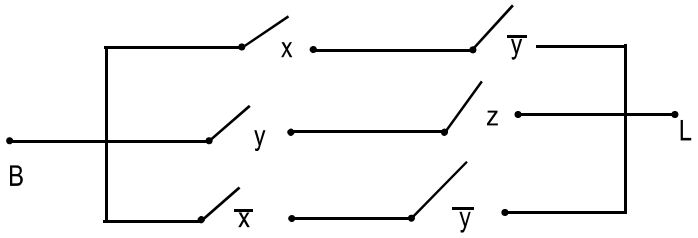
3. (a) Define equivalence relation. If R is the relation on N×N defined by (a, b) R(c, d) if and only if a + d = b + c, show that R is an equivalence relation. (6)

   (b) Define Lattice and chain. Prove that every chain is a distributive lattice. (6)

4. (a) Define Boolean Algebra. Establish the following relation in boolean algebra.

$$(a+b)\,(\bar{b}+c)+b.(\bar{a}+\bar{c})=a.\bar{b}+a.c+b$$ (6)

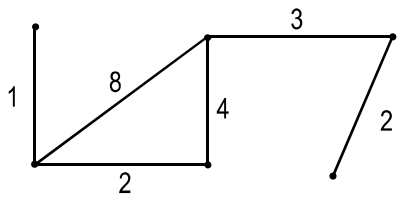
   (b) Write the function which represent the circuit shown in the figure and simplify. (6)



SECTION - C

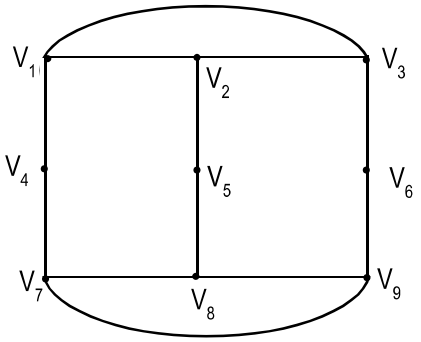
5. (a) Define Tree and Cut set. Prove that every cut set in a connected graph G must contain at least one branch of every spanning tree. (6)

   (b) Define Spanning Tree. In the given graph G, find all spanning tree and then find which is minimal spanning tree? (6)



6. (a) Show that $K_{3,3}$ satisfies inequality $e \leq 3v - 6$, but it is non-planar, where $K_{3,3,}$ is bipartite graph. v is number of vertices and e is number of edges of graph. (6)

(b) Show that the graph shown in the figure has no Hamiltonian cycle but the graph has 9 Hamiltonian path. (6)



Figure

SECTION - D

7. (a) Given $a_n = a_{n-1} + 2a_{n-2}$, for n = 3, 4,..... with $a_1 = 1$ and $a_2 = 3$. Find a formula for a_n. (6)

(b) Find the general solution of

$$a_r - 7a_{r-1} + 10a_{r-2} = 7.3^r, \quad r \geq 2. \qquad (6)$$

8. (a) Define group. Show that the set N of all natural numbers 1, 2, 3, 4,.....is not a group with respect to addition. (6)

(b) Prove that the set G = {0, 1, 2, 3, 4,} is a ring with respect to the operation of addition and multiplication modulo 5. (6)

SECTION - E

9. (a) Define biconditional statement in mathematical logic.

(b) Define principal Disjunctive normal form.

[P.T.O.]

(c) Define predicate.

(d) Define transitive relation.

(e) In Boolean Algebra minimize the expression $\overline{AB} + \overline{A} + AB$.

(f) Draw the circuit of x.(y+z)

(g) Define rooted tree.

(h) Find the maximum possible height of a binary tree with 13 vertices.

(i) Define Eulerian circuit.

(j) Define linear recurrence relation with constant coefficients.

(k) Solve the recurrence relation:

$$a_{n+2} - 3a_{n+1} + 2a_n = 0$$

(l) Define fields. (1×12=12)