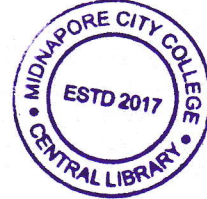


PG (CBCS)  
M.SC. Semester- III Examination, 2023  
Mathematics  
PAPER: C-MTM 304  
(DISCRETE MATHEMATICS)



Full Marks: 50

Time: 2 Hours

The figures in the right-hand margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable.

**GROUP-A**

1. Answer any **FOUR** of the following questions: 4×2=8
- State Hand Shaking Lemma.
  - Define binary tree.
  - Define Poset.
  - Prove  $\sim(p \vee q) \equiv \sim p \wedge \sim q$
  - What do you mean by centre of a graph?
  - State the principal of Mathematical induction.

**GROUP-B**

2. Answer any **FOUR** of the following questions: 4×4=16
- Prove that a graph G is disconnected if and only if it's vertex set  $v$  can be partitioned into two non-empty disjoint subset  $v_1, v_2$  such that there exists no edges in G whose one vertex is in  $v_1$  and other is in  $v_2$ .
  - Prove that  $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$ .
  - In the Boolean algebra  $(B, +, \cdot, ')$ , express the Boolean function  $f(x, y, z) = (x + y)(x + z) + y + z'$  in its disjunctive normal form.
  - Prove that a circuit free graph with n vertices and (n-1) edges is a tree.
  - Define converse, inverse, contrapositive statement of conditional statement. Then prove that conditional and contrapositive statements are logically equivalent. 2+2
  - Write down Huntington Postulates.

**GROUP-C**

3. Answer any **TWO** of the following questions: 2×8=16
- State the principle of inclusion-exclusion. In a class of 25 students, 12 students have taken Mathematics, 8 students have taken Mathematics but not Biology. Find the number of students who have taken Mathematics and Biology and those who have taken Biology but not Mathematics. 2+6

P.T.O

- b) Check whether the relation  $R = \{(a, b) \in Z \times Z : a - b \leq 0\}$  is partial order relation or not. What is Tautology. Define chain and anti-chain with examples. 4+2+2
- c) Prove, by mathematical induction,  $10^{n+1} + 10^n + 1$  is divisible by 3  $\forall n \in N$ . Draw a full adder using half adder. 6+2
- d) Define regular graph. Let  $G$  is a  $r$ -regular graph where  $r$  is odd. Show that  $G$  has even number of vertices. Again show that the number of edges of  $G$  is multiple of  $r$ . 2+(3+3)

[Internal Assessment- 10 Marks]

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