

No. of Printed Pages : 4

MCS-212

**MASTER OF COMPUTER
APPLICATIONS (MCA) (NEW)**

Term-End Examination

June, 2023

MCS-212 : DISCRETE MATHEMATICS

Time : 3 Hours

Maximum Marks : 100

Weightage : 70%

Note : (i) *Question No. 1 is compulsory*

(ii) *Attempt any **three** questions from the rest.*

1. (a) Verify that $a \wedge b \wedge \sim a$ is a contradiction and $(a \rightarrow b) \leftrightarrow (\sim a \vee b)$ is a tautology. 5
- (b) Reduce the Boolean expression $(X_1 \wedge X_2) \wedge (X_1 \wedge X_2')$ to its simplest form. 5
- (c) Find inverse of the function $f(x) = x^3 - 3$. 5
- (d) What is Kleene closure ? Find Kleene closure for $\Sigma = \{0, 1\}$. 5

P. T. O.

- (e) What is multiplication principle ? Use it to find the number of ways to choose two persons as President and Vice President from a party of 35 members. 5
- (f) Briefly discuss Inclusion-Exclusion principle with suitable example. 5
- (g) What is Eulerian graph ? Explain with the help of a suitable diagram. 5
- (h) What is Tautology ? Show that the given expression is a tautology : 5

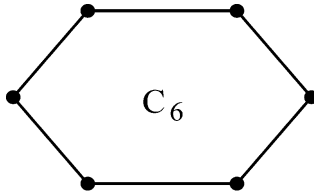
$$[(p \rightarrow q) \wedge \sim q] \rightarrow \sim p.$$

2. (a) Using induction, show that : 5

$$T_n = 2^n - 1, \quad n \geq 1.$$

- (b) In how many ways can 20 employees be assembled into 3 groups ? 5
- (c) Explain isomorphic graphs with suitable example. 5

- (d) What are Bipartite graphs ? Show that C_6 is a Bipartite graph : 5



3. (a) Check whether $(\sim p \vee q)$ and $(p \rightarrow q)$ are logically equivalent. 5
- (b) What is chromatic number of a graph ? Draw a graph with chromatic number 5. 5
- (c) Write short notes on the following : 10
- (i) Hamiltonian Graph
 - (ii) Vertex Cover Problem
4. (a) Show that the number of words of length 'n' on an alphabet for 'm' letters is m^n . 5
- (b) Construct the logic circuit and truth table for the given expression : 5+5
- $$x_1 \vee (x_2' \wedge x_3).$$
- (c) Given two switches, a battery and bulb design the Boolean circuit for AND gate and OR gate. 5

5. (a) Briefly discuss the following with suitable example for each : 5
- (i) Finite Automata
 - (ii) Regular expression
- (b) Differentiate between Turing Acceptable Language and Turing Decidable Language. 5
- (c) If C_n is the number of comparisons required to sort a list of n integers, determine the recurrence relation and iterative relation for C_n . 10