**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%*

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

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

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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

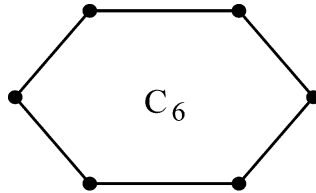(h) What is Tautology ? Show that the given expression is a tautology : 5

$$[(p \to q) \wedge \sim q] \to \sim p \,.$$

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.

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   (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