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MASTER OF SCIENCE (M.Sc) in COMPUTER APPLICATIONS
EXAMINATION : MAY- 2026
SEMESTER - I
Sub: Discrete Mathematics (MSC24-103)

Date : 30/05/2026

Total Marks : 60

Time: 10.00 am To 12.30 pm

Instruction:

1. All questions are compulsory unless and otherwise stated.
2. Bold figures to the right of every question are the maximum marks for that question.
3. Candidates are advised to attempt questions in order.
4. Answers written illegibly are likely to be marked zero.
5. Use of scientific calculators, Log tables, Mollier Charts is allowed.
6. Draw neat and labelled diagram wherever necessary.

Q.1 Answer the following in 2-3 lines (Any 5)

(10)

1. Given that : $X \sim B(n, p)$
If $p = 0.1$ and $\text{Var}(X) = 1.8$, Find n and $E(X)$.
2. What is cyclic group? Give an example.
3. If $f(x) = \frac{x}{x+1}$. Find the value of $f \circ f$.
4. How many 3 digits numbers can be formed with the numbers 0,1,2,3,5 & 6 if the repetition of the digits is not allowed.
5. For the function $f(x) = \frac{x+2}{x^3}$, find $f\left(\frac{1}{2}\right)$ & $f(-2)$.
6. An element $a \in G$ is called idempotent if $a^2 = a$. Show that: The only idempotent element in G is the unit element.
7. Write down True or False:
 - (i) In case of Poisson distribution, Mean = Variance.
 - (ii) In case of Binomial distribution, all the parameters are always greater than one.

Q.2 Answer the following in short. (Any 4)

(20)

1. Find $p.q$ and $(q.p)^{-1}$ for the following permutation:

$$p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 5 & 1 & 3 & 4 \end{pmatrix} \quad p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 1 & 2 & 3 & 4 \end{pmatrix}$$
2. Find the different number of arrangements of the letters of the words
(i) STATISTICS (ii) MATHEMATICS.
3. With the help of truth table, state whether the statement shows tautology, contradiction or contingency?

$$[p \rightarrow (\sim q \vee r)] \leftrightarrow (\sim [p \rightarrow (q \rightarrow r)])$$
4. Identify the parameters for the following function $f(x)$, which represents Normal distribution:

$$f(x) = \frac{1}{\sqrt{10\pi}} \cdot e^{\left(\frac{-x^2}{10} + 4x - 40\right)}, \quad -\infty < x < \infty$$

5. If G is a group in which $(a.b)^k = a^k . b^k$ for three consecutive integers 'k'. $\forall a, b \in G$. Show that : G is abelian group.
6. Find the matrices X and Y if ,

$$2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix} \text{ and } 3X + 2Y = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$$

Q.3 Answer the following in detail. (Any 3)

(30)

1. Solve:
 - (i) A random variable X follows Poisson distribution such that $\frac{4}{3}(P(X = 2)) = P(X = 1)$. (Given that : $e^{-1.5} = 0.2231$)
Find : (i) The parameter of the distribution. (ii) $P(X = 0)$ (iii) $P(X > 1)$

- (ii) The p.m.f. of a r.v. X is given by

$$P(X = x) = \frac{\binom{5}{x}}{32}, \quad x = 0, 1, 2, 3, 4, 5$$

$$= 0, \text{ otherwise.}$$

Find: (i) $P(x \leq 2)$ (ii) $P(x \geq 3)$

2. Do as directed:
 - (i) Write the dual of the statement given below
 $[q \vee (\sim q)] \equiv c$
 - (ii) Write the negation of 'All equilateral triangles are equiangular'.
 - (iii) Rewrite the statement ' If a man is clever then he is honest' without using 'if – then'.
 - (iv) Use quantifiers to convert the statement (given below) defined on a set of natural numbers , into a true statement.
 $n^2 \geq 1$
 - (v) 'Do you like Mathematics?' Is it a statement in Logic?

3. A firm manufacturing two types of electrical items A and B, can make a profit of Rs.20 per unit of A and Rs.30 per unit of B. Both A and B make use of two essential components a motor and a transformer. Each unit of A requires 3 units of motors and 2 transformers whereas each unit of B requires 2 motors and 4 transformers. The total supply of components per month is restricted to 210 motors and 300 transformers . How many units of A and B should be manufactured per month to maximize the profit? How much will be the maximum profit?
4. A problem in mathematics is given to three students A,B and C, whose chances of solving it are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{3}{4}$ respectively. Find the probability of the following events if all of them tried independently.
 - (i) Exactly one of them could solve the problem.
 - (ii) At the most one of them could solve the problem.
 - (iii) The problem is solved.
