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MASTER OF SCIENCE (M.Sc) IN COMPUTER APPLICATIONS
EXAMINATION : DECEMBER - 2025
SEMESTER – I

Sub: Discrete Mathematics (MSC-100-22/MSC24-103)

Date : 23/12/2025

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. If $f(x) = x^2 + \frac{1}{x^2}$ find $f\left(\frac{1}{x}\right)$. Are $f(x)$ and $f\left(\frac{1}{x}\right)$ equal?
2. Write down the following statement in logic, without using if-then :
 'If the given figure is parallelogram then its opposite sides are equal in length'.
3. 'If the sum of the measures of the two angles is 180° then the angles are called supplementary angles.' Write the negation of the statement.
4. Check whether the following distribution is representing p.m.f. or not?

x	0	1	2	3	4	5
p(x)	0.18	0.22	0.10	0.11	0.17	0.23
5. If $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 2 & 1 \end{pmatrix}$, $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{pmatrix}$. Find $(p.q)^{-1}$
6. Check whether the function $f(x) = 3x^2 - 2x + 5$ is even or odd?
7. If $A = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$ and $2A + 3B = 0$, find matrix B.

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

(20)

1. Find $E(x)$ and $V(x)$ for the following probability distribution:

x	1	2	3	4	5
p(x)	0.25	0.34	0.16	0.15	0.1

2. Prove the 'right cancellation law' in group.
3. If $f(x) = \frac{x-4}{4x-1}$. Find: $f \circ f$ and $f \circ f(2)$

4. Express the permutation given below, as a product of the cycles.

$$P = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ 9 & 8 & 3 & 4 & 7 & 6 & 1 & 5 & 2 & 10 \end{pmatrix}$$

5. If X has a Poisson Distribution with a parameter $m = 1$ Find: $P(x \leq 3)$ and $P(x \geq 1)$.
(Given that: $e^{-1} = 0.3678794$)

6. A carpenter has 90,80,50 running feet of teak wood, plywood, rosewood. The product A requires 2,1,1 running feet and product B requires 1,2,1 running feet of teak wood, plywood, rosewood respectively. On selling the products, he gains Rs.40 and Rs.50 on each of the units of products A and B respectively. Formulate the above problem as L.P.P. so as to maximize the profit.

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

(30)

1. Check whether the set $G = \{0, +1, -1\}$ is a group or not, under the operation $(*)$ such that $a * b = a + b$.
2. A coin is tossed 5 times. Find the probability that it shows heads
(i) Minimum 3 times. (ii) Maximum 2 times. (iii) Exactly 2 times.
3. Solve:
(i) If $y = f(x) = \left(\frac{x+1}{x-1}\right)$, $x \neq 1$ Show that: $x = f(y)$
(ii) If $f(x) = \log\left(\frac{x}{x-1}\right)$,
Find: (i) $f(a+1) + f(a)$ (ii) $f\left(\frac{a+1}{a-1}\right)$ (iii) Comment on the results.
4. (i) In how many ways, 4 books of Geography and 2 books of History can be arranged on a shelf so that, the books of history should never be side to side of each other?
(ii) In how many ways a committee of 4 students can be formed from 4 girls and 5 boys so that the committee should consists of equal number of boys and girls.
5. If G is a group in which $(a,b)^i = a^i, b^i$ for three consecutive integers, 'i' for all $a, b \in G$ then show that group G is abelian.
