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MASTER OF COMPUTER APPLICATIONS (MCA)/
M.SC IN COMPUTER APPLICATIONS
EXAMINATION : JUNE - 2025
SEMESTER - I

Sub: Discrete Mathematics (MCA-100-22/MCA24-103/MS100-22/MS24-103)

Date : 9/06/2025

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. Check whether the function $f(x) = x^4 + x^2 - 10$ is even or odd?
2. Given that : $X \sim B(n, p)$
If $p = 0.6$ and $E(X) = 6$, Find n and $\text{Var}(X)$.

3. Check whether the function given below is p.d.f. or not?

$$f(x) = \frac{3}{2}x \left(1 - \frac{x}{2}\right), 0 \leq x \leq 2$$

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

4. Write down True or False:

- (i) In case of Binomial distribution, Mean < Variance.
- (ii) In case of Poisson distribution, Mean = Variance.

5. Find the order of permutation:

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

6. If $f(x) = x^2 + \frac{1}{x^2}$ Show that: $f(x) = f\left(\frac{1}{x}\right)$.
7. Find the different number of arrangements of the letters of the word 'MAHARASHTRA'.

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

(20)

1. Show the logical equivalence for the statement, with the help of truth table.

$$[\sim(p \vee q) \vee (p \vee q)] \wedge r \equiv r$$

2. Write down the Negations of the following statements in Logic:

- (i) Some parallelograms are rectangles.
- (ii) 4 is a perfect square and 7 is a prime.
- (iii) The given curve is a circle if and only if it is not a square.

3. Prove the 'Right cancellation law' in groups.
4. Suppose that the life time of a certain electric component is exponentially distributed with a mean life of 1800 hrs. What is the probability that, the component will survive after 1000 hrs.
5. If $y = f(x) = \frac{x-1}{x+1}$. Find the value of $f(y)$.
6. How many 4 digits numbers can be formed with the numbers 0,1,2,3,4,5,6,7,9 if the repetition of the digits is not allowed.

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

(30)

1. (i) A carpenter has 90, 80, 50 running feet of teak wood, plywood, rosewood. The product A requires 2, 1, 1 running feet and B requires 1, 2, 1 running feet of teak wood, plywood and rosewood respectively. On selling he gets a profit of Rs.48 on each unit of A and Rs.40 on each unit of B. Formulate the problem as LPP for maximizing the profit.

(ii) If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ Show that : $A^2 = I$ also Find A^{-1}

2. If $f(x) = x - 3$, $g(x) = x + 2$, Find: $f \circ f$, $g \circ g$, $f \circ g$ & $g \circ f$.
Also find $f^{-1}(x)$, $g^{-1}(x)$.
3. Two friends A and B appeared for an interview for two different posts in a company. The probability of selection of A is $1/5$ and that of B is $2/3$. Find the probability of the following events if both of them tried independently.
 - (i) Exactly one of them get selected.
 - (ii) At least one of them get selected.
 - (iii) At the most one of them get selected.
4. Find the probability that : (i) X is positive (ii) X is non-negative (iii) X is odd (iv) X is even. for the following probability distribution.

x	-3	-2	-1	0	1	2	3
p(x)	0.05	0.1	0.15	0.20	0.25	0.15	0.1
