

TILAK MAHARASHTRA VIDYAPEETH, PUNE
MASTER OF COMPUTER APPLICATIONS (MCA)
EXAMINATION : DECEMBER - 2024
SEMESTER - I
Sub: Discrete Mathematics (MCA24-103)

Date : 27/12/2024

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 $f(x) = 6x - 2$, $g(x) = 3x + 5$,
Find : $f \circ g(-1)$ & $g \circ f(1)$. Are they Equal?
2. Re-write the following statement without using if-then.
'If two sides of triangle are of equal length then the angles opposite to congruent sides are congruent.'
3. Write down the dual of the following statements:
 - (i) $(p \wedge q) \vee ((\sim r) \vee (\sim s))$
 - (ii) $(p \vee q) \rightarrow ((\sim r) \wedge p)$
4. Check whether the function given below is p.d.f. or not?

$$f(x) = \frac{1}{2\sqrt{x}}, 0 \leq x \leq 1$$

$$= 0, \text{ otherwise.}$$
5. Given that : $X \sim B(n, p)$
If $p = 0.6$ and $E(X) = 6$, Find n and $\text{Var}(X)$.
6. Find the different arrangements of the letters of the word 'STATISTICS'.
7. What is cyclic group? Give an example.

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)	0.11	0.28	0.25	0.06	0.3

2. There are three bags of colour Blue, Green and Yellow. Green bag contains 3 silver and 2 gold coins. Blue bag contains 5 silver and 3 gold coins and Yellow bag contains 2 silver and 2 gold coins. One of the three types of bags is selected at random and a gold coin is picked up from it. Find the probability that it is from green bag.

3. When any set can be called as a Group, for any binary operation ' $*$ ' ?
4. A fair coin is tossed 12 times. Find the probability of getting at least one head.
5. Solve the equations by Cramer's Rule:
 $x + y + 3z = 5$, $6x + y - z = 4$, $4x + y - 2z = 24$
6. Prove the 'Left cancellation law' in groups.

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

(30)

1. Check whether the following statements shows Tautology, Contradiction or Contingency?
 - (i) $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$
 - (ii) $(p \wedge (\sim q)) \leftrightarrow (p \rightarrow q)$
 - (iii) $((\sim p) \rightarrow q) \wedge (p \wedge r)$
2. In how many ways 5 boys and 2 girls can be arranged in a row for a photograph so that the two girls should never be side to side of each other.
3. If $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$, $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$. Find (i) $(p \cdot q^{-1})$ (ii) $(p^{-1} \cdot q)$
4. In how many ways a committee of 5 students can be formed from 10 students in a class so that ,
 - (i) Two particular students A & B should always be there in a committee.
 - (ii) Two particular students A & B should never be there in a committee.
 - (iii) A is ready to be a member of committee only if B is not there in a committee.
 - (iv) A is ready to be a member of committee only if B is there in a committee.
5. (i) If G is a group in which $(a \cdot b)^i = a^i \cdot b^i$ for three consecutive integers i , $\forall a, b \in G$.
 Show that : G is abelian group.
 (ii) Show that: If group G is cyclic then it is abelian.
