

**TILAK MAHARASHTRA VIDYAPEETH, PUNE**  
**MASTER OF SCIENCE (M.SC) IN COMPUTER APPLICATIONS**  
**EXAMINATION : DECEMBER - 2023**

**SEMESTER - I**

**Sub: Discrete Mathematics ( MSC-100-22)**

**Date : 27/12/2023**

**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. Find the distinct arrangements of the letters of the word 'MISSISSIPPI'
2. If  $f(x) = \frac{2x-1}{3}$ . Find  $f^{-1}(x)$ . Also find  $f^{-1}(-3)$ .
3. A coin is tossed 8 times. Find the probability of getting at the most 1 heads.
4. If  $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 1 & 3 \end{pmatrix}$ ,  $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 2 & 4 \end{pmatrix}$ . Find  $pq^{-1}$
5. If  $f(x) = 6x + 1$ ,  $g(x) = 2x - 3$ . Find  $f \circ g$  &  $g \circ f$ .
6. For certain data,  $b_{xy} = 5/4$  and  $b_{yx} = 1/2$ . Find Karl Pearson's correlation coefficient.
7. Write the negation of the following statement : If  $a = b$  then  $a^2 = b^2$ .

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

**(20)**

1. Prove the left cancellation law in a Group.
2. Find the Mean and Variance for the following probability distribution:

X	0	1	2	3	4
P(X)	0.25	0.22	0.40	0.06	0.07

3. Solve the equations by Cramer's Rule:  
 $x - y - z = -1$ ,  $3x + 6y - 8z = 1$ ,  $x - 3y + z = -1$
4. Find lines of regressions Y on X for the following data:

X	4	5	6	3	2
Y	12	10	8	4	6

5. Group G is called abelian group if and only if  $(ab)^2 = a^2 \cdot b^2 \quad \forall a, b \in G$

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

**(30)**

1. With the help of truth tables, prove the following results:
  - (i)  $((\sim p) \vee (\sim q)) \equiv (\sim (p \wedge q))$
  - (ii)  $\sim (p \rightarrow q) \equiv [p \wedge (\sim q)]$

2. On a shooting range, A, B & C are the three competitors. The probability that A will shoot the target is  $\frac{1}{4}$ , that of B is  $\frac{2}{5}$  and that of C is  $\frac{2}{7}$ . Find the probability of the following events if all of them have tried independently.
- (i) At least one of them could shoot the target.
  - (ii) At the most one of them could shoot the target.
  - (iii) Exactly one of them could shoot the target.

3. Find Karl Pearson's coefficient of correlation for the following data:

X	11	13	14	15	14	15	15	14	16	13
Y	50	50	56	60	64	65	65	60	60	50

4. Find  $P(X \geq 2)$ ,  $P(X < 1)$  and  $P(X \text{ is an even number})$  for the following data:

X	0	1	2	3	4	5	6
F(X)	0.15	0.23	0.58	0.63	0.77	0.92	1

-----