



RAN-2311001101040001

B.Sc. (IT) M.Sc (IT) (Sem. -I) Examination February - 2026
Mathematics - I (Paper - MDC -102)

Time: 2 Hours]

[Total Marks: 50

સૂચના : / Instructions (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી. Fill up strictly the above details on your answer book (2) All questions are compulsory. (3) Figures to the right indicate marks of the questions. (4) Follow usual notations.	Seat No.: <table style="width: 100%; text-align: center;"> <tr> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> <td style="border: 1px solid black; width: 20px; height: 20px;"></td> </tr> </table> Student's Signature						

Q.1. A. Attempt Any Two: (6)

1. If the function $f: R \rightarrow R$ given by $f(x) = x^2 - 2$ and $g: R \rightarrow R$ given by $g(x) = 3x - 5$ then find $(fog)(x)$, $(gof)(x)$, $(gog)(-3)$.
2. Let $f: R \rightarrow R$ be a function defined as $f(x) = (3x + 4)/5$. Prove that f is one-to-one and onto and hence find the inverse of f .
3. Let R be the set of real numbers. Define a binary operation $*$ on R as $a * b = a + b + ab$, $\forall a, b \in R$. Find the inverse of 21.

B. Attempt Any Two: (6)

1. Define the following terms with illustration.
 - i) Order of a matrix
 - ii) Symmetric matrix
 - iii) Diagonal matrix
2. Prove that $1 + \frac{3}{4} + \frac{9}{16} + \frac{27}{64} + \dots$ converges and find its sum.
3. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & -1 & 6 \\ -1 & 5 & 1 \end{bmatrix}$ using elementary row operation.

Q.2. A. Attempt Any Two: (6)

1. Let R and S be two relations on $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c\}$ given by $R = \{(1, a), (2, c), (3, a), (3, b), (4, c)\}$ and $S = \{(1, a), (2, c), (3, a), (4, b), (2, a), (3, b), (4, c)\}$. List the elements of $R \cap S$, $R \cup S$, R^{-1} .
2. Prove that the function $f: R \rightarrow R$ defined as $f(x) = \frac{3x+4}{5}$.
 Prove that f is one-one and onto, also find the inverse of f .
3. If R and S are equivalence relations in the set X , prove that $R \cap S$ is equivalence relation.

B. Attempt Any Two: (6)

1. For any square matrix A , prove that:
 - (i) $A + A^T$ is symmetric matrix.
 - (ii) $A - A^T$ is skew-symmetric matrix.

- If $A = \begin{bmatrix} 3 & 0 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 1 & -5 \end{bmatrix}$, then find $A - B$, AB , A^2 .
- Show that the following system of equation is consistent and hence solve it.
 $x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2$, $x - y + z = -1$.

Q.3. A. Attempt Any Two:

(6)

- Define mean, median, mode. State merits and demerits of median.
- Find the mean, median and mode for the following data:

Marks	30–34	35–39	40–44	45–49	50–54	55–64
No. of marks	3	5	12	18	14	8

- Calculate mean deviation(about median) of the following data:

Ages (in years)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of persons	13	38	67	76	22	4

B. Attempt Any Two:

(6)

- In usual notation prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
- Calculate the standard deviation of the following data:

Marks	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20
No. of Students	5	12	8	7	8

- If the Mean of a Poisson Variable is 3, find the probability that
 (i) $X=0$, (ii) $0 < X \leq 3$, (iii) $1 \leq X < 5$.

Q.4. A. Attempt Any Two:

(6)

- In a factory producing screws, three machines produces respectively 25%, 45% and 30% of the total production out of which 5%, 3% and 2% are defective respectively. One screw draw from random form the production and found that defective, what is the probability that it is produced by machine II.
- There are 20 tickets numbered 1,2, ..., 20. One ticket is drawn at random. Find the probability that the ticket bears a number which is (i) even, (ii) a perfect square, and (iii) multiple of 3.
- Define
 - Mutually Exclusive Events
 - Null event
 - Trial

B. Attempt Any Two:

(8)

- State the probability function of a Binomial distribution and obtain its mean, variance.
- Calculate first quartile, 7th decile, 80th percentile and quartile deviation the following distribution:

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequencies	3	7	18	16	8	4

- For two events A and B, $P(A) = 1/2 = P(B)$ and $P(A \cup B) = 2/3$ then find $P(A' \cup B')$, $P(A' \cap B')$, $P(A \cap B)$ and $P(A \cap B')$.