



RAN-2311001101040001

B.Sc. (IT) (M.Sc. IT) (Sem. - I) Examination November - 2025

MDC - Mathematics - I (Paper - 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.:

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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 $(fog)(x)$, $(gof)(x)$, $(gog)(x)$.
2. Let I be the set of positive integers. Let $\equiv m$ be the congruence modulo m relation on I . Show that it is transitive.
3. Let R be the set of real numbers. Define a binary operation $*$ on R as $a * b = a + b$, $\forall a, b \in R$. Find the inverse of 12.

B. Attempt Any Two:

[6]

1. Define the following terms with illustration
 - i) Transpose of a matrix
 - ii) Symmetric matrix
 - iii) Scalar matrix
2. Find the inverse of the matrix $A = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & -1 \\ 3 & -5 & 0 \end{bmatrix}$ using elementary row operation.
3. Find the value of $7^2 + 8^2 + 9^2 + \dots + 20^2$.

Q. 2 A. Attempt Any Two:

[6]

1. Let R_1 and R_2 be two relations on $A = \{1, 2, 3, 4\}$ given by $R_1 = \{(1, 1), (3, 4), (4, 2)\}$ and $R_2 = \{(1, 1), (2, 1), (3, 1), (4, 4), (2, 2)\}$. List the elements of $R_1 \cap R_2$, $R_1 \circ R_2$, and $R_2 \circ R_1$.
2. Prove that the function $f : R \rightarrow R$ defined as $f(x) = 2x - 3$ is invertible. Also, find f^{-1} .
3. Find all the possible function from $\{a, b\}$ to $\{9, 10\}$ how many of them are one - one?

B. Attempt Any Two:

[6]

1. Show that every square matrix can be written as a sum of a symmetric matrix and a skew - symmetric matrix.

- If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$, then find k so that $A^2 = 8A + kI$.
- Solve the following system of equations
 $3x + 2y + 5z = 1$, $2y + z = 0$, $3x - 2y + 6z = -5$.

Q. 3 A. Attempt Any Two:

[6]

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

Class	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69
Frequency	5	18	12	8	15	17

- Calculate Quartile Deviation and its coefficient from the following data:

Ages (in year)	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]

- If A and B are two independent events, then the probability of occurrence of at least one of A and B is given by $1 - P(A')P(B')$.
- Calculate the mean deviation (about median) of the following data:

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

- The mean and variance of a binomial variate are 9 and 7. Find $P(X > 4)$.

Q. 4 A. Attempt Any Two:

[6]

- In a factory producing screws, three machines produce respectively 30%, 40% and 30% of the total production out of which 5%, 4% and 2% are defective respectively. One screw drawn from random from the production and found that defective, what is the probability that it is produced by machine II.
- From a collection of 11 bulbs, of which 4 are defective, 3 bulbs are selected at random and fitted into lamps. Find the probability that
 - all three bulbs glow, and
 - the room is lit.
- Define
 - Mutually Exclusive Events
 - Conditional Probability
 - Event

B. Attempt Any Two:

[8]

- State the probability function of a Poisson distribution and obtain its mean, variance.
- Calculate standard deviation and coefficient of variance for the following distribution:

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequencies	3	7	12	15	8	3	2

- 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 $P(A' \cap B)$.