MATHEMATICS (M003)

Maximum Marks: 40

Time allowed: 60 minutes

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **10** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers

*Attempt **all** questions from **Section A** and **any two** questions from **Section B**.*

All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ]

Mathematical tables and graph papers are provided

SECTION A (20 marks)

*(Attempt **all** questions from this **Section**)*

Question 1

Choose the correct answers to the questions from the given options.   [7]

(Do not copy the questions, write the correct answers only.)

(i) Seema deposited ₹100 per month for 24 months in a bank's recurring deposit account. If the bank pays an interest of 10% p.a., then the amount she gets on maturity is:
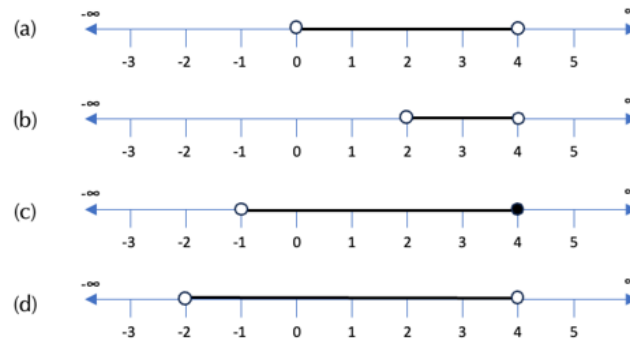
(a) ₹1,490   (c) ₹2,065

(b) ₹1,940   (d) ₹2,650

(ii) If $2x - 3 < x + 1 < 4x + 7$, $x \in \mathbb{R}$, then the solution set of x on the number line is:

(iii) The value of k for which the equation $x^2 + 4kx + (k^2 - k + 2) = 0$ has equal roots, is:

(a) $-1, -\frac{2}{3}$

(b) $-\frac{2}{3}, 1$

(c) $\frac{2}{3}, -1$

(d) $1, \frac{2}{3}$

(iv) If both $(x - 2)$ and $\left(x - \frac{1}{2}\right)$ are the factors of $px^2 + 5x + r$, then:

(a) $p = r$

(b) $p = 2r$

(c) $2p = r$

(d) $p = r + 2$

(v) If $\begin{bmatrix} 1 & 2 \\ 2 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 20 \\ 90 \end{bmatrix}$, then the values of x and y are:

(a) $x = 10, y = 10$

(b) $x = 5, y = 4$

(c) $x = 0, y = 10$

(d) $x = 4, y = 5$

(vi) Find the value of
$$\frac{\sin \theta \tan \theta}{1 - \cos \theta}$$

(a) $1 - \sin \theta$

(b) $1 + \sec \theta$

(c) $1 + \sin \theta$

(d) $1 - \sec \theta$

(vii) Find the average of the following distributions:

Variate (x)	10	20	50	70	90
Frequenty (f)	8	10	10	12	10

(a) 47.5

(c) 52.4

(b) 51.7

(d) 52.8

Question 2

(i) Priyanka has a recurring deposit account of ₹1000 per month at 10% per annum. If she gets ₹5550 as interest at the time of maturity, find the total time for which the account was held. [4]

(ii) Prove the following identities: $\dfrac{1 - \tan^2\theta}{\cot^2\theta - 1} = \tan^2\theta$ [4]

(iii) Marks obtained by 200 students in an examination are given below: [5]

Marks	Frequency
0 - 10	5
10 - 20	11
20 - 30	10
30 - 40	20
40 - 50	28
50 - 60	37
60 - 70	40
70 - 80	29
80 - 90	14
90 - 100	6

Draw an ogive for the given distribution taking 1 cm = 10 marks on one axis and 1 cm = 20 students on the other axis. Using the graph, determine:

- The median marks

- The number of students who failed if minimum marks required to pass is 40

- If scoring 85 and more marks is considered as grade one, find the number of students who secured grade one in the examination.

SECTION B (20 marks)

*(Attempt **any two** questions from this **Section**)*

Question 3

(i) Given $\begin{bmatrix} x & 3 \\ y & 3 \end{bmatrix}$, [3]

If $A^2 = 3I$, where I is the identity matrix of order 2, find x and y.

(ii) Prove that: [3]

$$\sqrt{\frac{1 - \cos\theta}{1 + \cos\theta}} = \operatorname{cosec}\theta - \cot\theta$$

(iii) Solve the following inequation, write down the solution set and represent it on the real number line: [4]

$$-2 + 10x \le 13x + 10 < 24 + 10x, x \in \mathbb{Z}$$

Question 4

(i) The average score of boys in an examination of a school is 71 and of girls is 73. The average score of school in that examination is 71.8. Find the ration of the number of boys to the number of girls appeared in the examination. [3]

(ii) Using the Remainder Theorem find the remainders obtained when $x^3 + (kx+8)x+k$ is divided by $x + 1$ and $x - 2$. [3]

(iii) Given: [4]

$$A = \begin{bmatrix} 2 & -6 \\ 2 & 0 \end{bmatrix}, B = \begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix}, C = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$$

Determine the matrix X such that:

$$A + 2X = 2B + C$$

Question 5

(i) Find the solution set of the following inequalities and draw the graph of their solution sets: [4]

$$\left|\frac{x-5}{3}\right| < 6, x \in \mathbb{R}$$

(ii) Using the step deviation method find the arithmetic mean of the distribution: [6]

Variate (x)	5	10	15	20	25	30	35	40	45	50
Frequenty (f)	20	43	75	67	72	45	39	9	8	6