MATHEMATICS (M005)

Maximum Marks: 40

Time allowed: **90 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) If the average of the following distribution is 9, find the value of m:

Variate (x)	2	4	m	10	12
Frequency (f)	3	2	3	1	2

    (a) 17   (c) 11

    (b) 15   (d) 9

(ii) If $\sin \theta = \dfrac{12}{13}$, then find the value of $\dfrac{2 \sin \theta - 3 \cos \theta}{4 \sin \theta - 9 \cos \theta}$

    (a) 1   (c) 5

    (b) 3   (d) 7

(iii) If $x = 2$ is a solution of the quadratic equation $kx^2 + 2x - 3 = 0$, then the value of k is:

    (a) -1   (c) $\dfrac{1}{4}$

    (b) -4   (d) $-\dfrac{1}{4}$

(iv) If $x : y = 2 : 3$, then the value of $(7x - 4y) : (5x + 2y)$ is:

    (a) 1:8   (c) 4:9

    (b) 2:3   (d) 5:7

(v) If $A = \begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$, then $(A + 2I)(A - 3I)$ is equal to:

    (a) $\begin{bmatrix} 4 & -4 \\ 8 & -8 \end{bmatrix}$ (c) $\begin{bmatrix} -4 & 4 \\ -8 & 8 \end{bmatrix}$

    (b) $\begin{bmatrix} 4 & 8 \\ -4 & -8 \end{bmatrix}$ (d) $\begin{bmatrix} -4 & 4 \\ 8 & -8 \end{bmatrix}$

(vi) The solution set of $-3 + x \le \dfrac{8x}{3} + 2 \le \dfrac{14}{3} + 2x, x \in \mathbb{R}$

    (a) $-3 < x < 4$ (c) $-3 \le x \le 4$

    (b) $-3 < x \le 4$ (d) $-3 \le x < 4$

(vii) Mrs. Goswami deposits ₹ 1,000 every month in a reurring deposit account for 3 years at 8% interest per annum. Find the matured value.

    (a) ₹ 40,400   (c) ₹ 44,400

    (b) ₹ 48,000   (d) ₹ 48,040

Question 2

(i) Sonia deposited ₹ 600 per month for $2\frac{1}{2}$ years into a recurring deposit with 10% rate of interest p.a..

Find the maturity value of this account. [4]

(ii) Prove that: [4]

$$\sin^6 \theta + \cos^6 \theta = 1 - 3\sin^2 \theta \cos^2 \theta$$

(iii) Use remainder theorem to factorize the following polynomial [5]

$$2x^3 + 3x^2 - 9x - 10$$

SECTION B (20 marks)

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

Question 3

(i) Determine the roots of the equation: [3]

$$\frac{2}{x^2} - \frac{5}{x} + 2 = 0$$

(ii) Prove that $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta) = 2$ [3]

(iii) Find the value of the constant a and b, if $(x-2)$ and $(x-3)$ are both factors of the expression $x^3 + ax^2 + bx - 12$. [4]

Question 4

(i) Given $A = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$, Determine $A^2 - 4A$. [3]

(ii) Solve: [3]

$$\frac{2x-3}{4} \geq \frac{1}{2}, x \in \{0, 1, 2, \cdots, 8\}$$

(iii) If $\dfrac{x^2 + y^2}{x^2 - y^2} = \dfrac{17}{8}$, then find the value of: [4]

$$\frac{x^3 + y^3}{x^3 - y^3}$$

Question 5

(i) Given: [4]

$$P = \{x : 5 < 2x - 1 \le 11, x \in \mathbb{R}\}$$

$$Q = \{x : -1 < 3 + 4x < 23, x \in \mathbb{I}\}$$

Represent P and Q on number lines. Write down the elements of $P \cap Q$

(ii) Draw a histogram from the following frequency distribution and find the mode from the graph. [6]

Class	Frequency (f)
0 - 5	2
$5 - 10$	5
$10 - 15$	18
$15 - 20$	14
$20 - 25$	8
$25 - 30$	5