MATHEMATICS (M010)

Maximum Marks: 40

Time allowed: **75 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) Find the value of $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$:

    (a) $\tan\theta$ (c) $\sin\theta$

    (b) $\cot\theta$ (d) $\cos\theta$

(ii) The 8th term of the A.P. 12, 8, 4, 0, ... is:

    (a) -16   (c) -20

    (b) -12   (d) -4

(iii) The simplified form of the following is:

$$\begin{bmatrix} \cos 45° & \sin 30° \\ \sqrt{2}\cos 0° & \sin 0° \end{bmatrix}\begin{bmatrix} \sin 45° & \cos 90° \\ \sin 90° & \cot 45° \end{bmatrix}$$

(a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & \frac{1}{2} \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

(iv) Using remainder theorem, the factors of the polynomial $2x^3 + 3x^2 - 9x - 10$ are:

(a) $(x-2), (x-3), (2x+5)$ (c) $(x-2), (x-1), (2x-9)$

(b) $(x-2), (x+1), (2x+5)$ (d) $(x-2), (x+4), (2x-9)$

(v) Mr. Singh opened a R.D. account for 2 years and deposited ₹ 2,500 per month. At the time of maturity, he got ₹ 67,500. The total interest earned by him during this period is:

(a) ₹ 8,500   (c) ₹ 7,000

(b) ₹ 8,000   (d) ₹ 7,500

(vi) If $\dfrac{6}{x} - \dfrac{2}{x-1} = \dfrac{1}{x-2}$, then the value(s) of x is/are:

(a) $\dfrac{1}{3}, \dfrac{4}{3}$ (c) 1, 2

(b) 2, $\dfrac{1}{3}$ (d) 3, $\dfrac{4}{3}$

(vii) If $\dfrac{\sqrt{5x} + \sqrt{2x-6}}{\sqrt{5x} - \sqrt{2x-6}} = 4$, then the value of x is:

(a) 20   (c) 30

(b) 10   (d) 40

Question 2

(i) Solve $x^2 + 7x = 7$ and give your answer correct to two decimal places. [4]

(ii) Solve the following equation: [4]

$$\frac{\cos\theta}{1 - \sin\theta} + \frac{\cos\theta}{1 + \sin\theta} = 4$$

(iii) Find the value of $a : b$, given that: [5]

$$\frac{a^3 + 3ab^2}{b^3 + 3a^2b} = \frac{63}{62}$$

SECTION B (20 marks)

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

Question 3

(i) Zafarullah has a recurring deposit account in a bank for $3\frac{1}{2}$ years at 9.5% p.a. If he gets ₹ 78,638 at the time of maturity, find the monthly installment. [3]

(ii) Solve and represent the solution on a number line. [3]

$$-3 + x \leq \frac{8x}{3} + 2 \leq \frac{14}{3} + 2x, x \in \mathbb{I}$$

(iii) The angle of elevation from a point P of the top of a towner QR, 50 m high is 60° and that of the tower PT from a point Q is 30°. Find the height of the tower PT, correct to the nearest metre. [4]
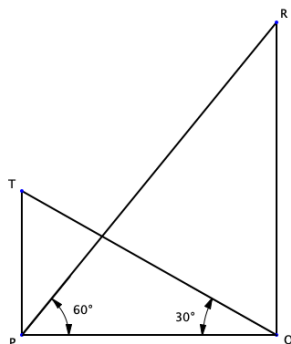
Question 4

(i) Determine which term of the sequence 4, 9, 14, 19, ...is 129. [3]

(ii) Find the value of a and b so that the polynomial $x^3 - ax^2 - 13x + b$ has $(x-1)(x+3)$ as factor. [3]

(iii) Prove that: [4]

$$\sqrt{\frac{1 + \cos\theta}{1 - \cos\theta}} = \frac{\tan\theta + \sin\theta}{\tan\theta \sin\theta}$$

Question 5

(i) Let $A = \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 \\ -3 & -2 \end{bmatrix}$ and $C = \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix}$. Determine: [4]

$$A^2 + AC - 5B$$

(ii) Use graph paper for the following question. [6]

A survey regarding height (in cm) of 60 boys belonging to Class 10 of a school was conducted. The following data was recorded:

Height (in cm)	No. of boys
$135 - 140$	4
$140 - 145$	8
$145 - 150$	20
$150 - 155$	14
$155 - 160$	7
$160 - 165$	6
$165 - 170$	1

Taking 2 cm = height of 10 cm along one axis and 2 cm = 10 boys along the other axis draw and ogive of the above distribution. Use the graph to estimate the following:

- The Median

- Lower quartile

- If above 158 cm is considered as the tall boys of the class. Find the number of boys in the class who are tall.