

MATHEMATICS (M002)

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) If $A = \begin{bmatrix} 2 & 3 \\ 7 & 5 \end{bmatrix}$, then A^2 is:

(a) $\begin{bmatrix} 4 & 6 \\ 14 & 10 \end{bmatrix}$

(c) $\begin{bmatrix} 4 & 9 \\ 49 & 25 \end{bmatrix}$

(b) $\begin{bmatrix} 25 & 21 \\ 49 & 46 \end{bmatrix}$

(d) $\begin{bmatrix} 25 & 49 \\ 15 & 46 \end{bmatrix}$

(ii) If $-1 < 3 + 4x \leq 23, x \in \mathbb{R}$ (real numbers), then the solution set of x is:

(a) $-1 \leq x < 5, x \in \mathbb{R}$

(c) $-1 \leq x \leq 5, x \in \mathbb{R}$

(b) $-1 < x \leq 5, x \in \mathbb{R}$

(d) $-1 < x < 5, x \in \mathbb{R}$

(iii) If the replacement set is the set of integers between -10 and 10, then the solution of the below inequality is:

$$-2 < \frac{1}{2} - \frac{2x}{3} < 1\frac{5}{6}$$

(a) $\{-1, 0, 1, 2\}$

(c) $\{-1, 0, 1, 2, 3\}$

(b) $\{-2, -1, 0, 1, 2, 3\}$

(d) $\{-2, -1, 0, 1, 2\}$

(iv) For the equation $\sqrt{4-x} + \sqrt{x+9}$, the values of x are:

(a) 0, -5

(c) -1, 6

(b) 2, 3

(d) 4, 7

(v) The remainder on dividing $2x^3 + 6x^2 - 17x - 4$ by $2x + 1$ is:

(a) $-\frac{17}{4}$

(c) $-\frac{43}{4}$

(b) $\frac{23}{4}$

(d) $\frac{15}{4}$

(vi) The sum of remainders obtained on dividing $x^3 + (kx + 8)x + k$ by $x + 1$ and $x - 2$ is 1, then the value of k is:

(a) 2

(c) -1

(b) 1

(d) -2

(vii) Find the value of:

$$\frac{\sin A}{1 + \cos A} + \frac{1 + \cos A}{\sin A}$$

(a) $2 \operatorname{cosec} A$

(c) 1

(b) $2 \sin A$

(d) None of these

Question 2

- (i) Find the value of 'a' if $x - a$ is a factor of the polynomial $3x^3 + x^2 - ax - 81$. [4]
- (ii) Solve the following inequation. Write down the solution set and represent it on the real number line. [4]

$$-5(x - 9) \geq 17 - 9x > x + 2, x \in \mathbb{R}$$

- (iii) 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 ratio of the number of boys to the number of girls appeared in the examination. [5]

SECTION B (20 marks)

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

Question 3

- (i) Factorize completely using factor theorem: [4]

$$2x^3 - x^2 - 13x - 6$$

- (ii) Use **graph paper** to answer this question. [6]

During a medical checkup of 60 students in a school, weights were recorded as follows:

Weight (in kg)	Number of Students (f)
28 - 30	2
30 - 32	4
32 - 34	10
34 - 36	13
36 - 38	15
38 - 40	9
40 - 42	5
42 - 44	2

Taking 2 cm = 2 kg along one axis and 2 cm = 10 students along the other axis draw an ogive. Use your graph to find the:

- Median
- Upper quartile
- Number of students whose weight is above 37 kg

Question 4

- (i) Prove that: [3]

$$\frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta} = 2 \sec^2 \theta$$

- (ii) Solve the following quadratic equation. Give your answer correct to two decimal places. [3]

$$x^2 - 7x + 3 = 0$$

- (iii) Solve the following inequation and represent the solution set on the number line. [4]

$$\frac{3x}{5} + 2 < x + 4 \leq \frac{x}{2} + 5; x \in \mathbb{R}$$

Question 5

- (i) Prove that: [3]

$$\frac{\sin A}{1 + \cot A} - \frac{\cos A}{1 + \tan A} = \sin A - \cos A$$

- (ii) What must be added to the polynomial $2x^3 - 3x^2 - 8x$, so that it leaves a remainder 10 when divided by $2x + 1$? [3]

- (iii) If $A = \begin{bmatrix} 3 & 0 \\ 5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 2 \\ 1 & 0 \end{bmatrix}$ [4]
Find $A^2 - 2AB + B^2$