

MATHEMATICS (M007)

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) If $2x - 5 \leq 5x + 4 \leq 11$ and x is a natural number (\mathbb{N}), then the solution set of x is:

(a) $\{ 1 \}$

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

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

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

(ii) If $x : y = 5 : 3$, then the value of $(8x - 5y) : (6x + 7y)$ is:

(a) $24 : 27$

(c) $25 : 9$

(b) $35 : 37$

(d) $25 : 51$

(iii) Evaluate $(\sec \theta - \tan \theta)^2$:

(a) $\frac{1 + \sin \theta}{\cos \theta}$

(c) $\frac{1 - \sin \theta}{1 + \sin \theta}$

(b) $\frac{\sin \theta}{1 - \sin \theta}$

(d) None of these

(iv) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then the matrix BA is:

(a) $\begin{bmatrix} 11 & 16 \\ 10 & 16 \end{bmatrix}$

(c) $\begin{bmatrix} 11 & 10 \\ 16 & 16 \end{bmatrix}$

(b) $\begin{bmatrix} 10 & 22 \\ 7 & 17 \end{bmatrix}$

(d) $\begin{bmatrix} 10 & 7 \\ 22 & 17 \end{bmatrix}$

(v) The other factors of the polynomial $2x^3 - x^2 - 5x - 2$, if one of its factor is $(x - 2)$ are:

(a) $(x + 1), (2x - 1)$

(c) $(x + 1), (2x + 1)$

(b) $(x - 1), (2x - 1)$

(d) $(x - 1), (2x + 1)$

(vi) If the equation $3x^2 - 6x + k = 0$ has real and distinct roots, then the value of k is:

(a) $k \leq 3$

(c) $k > 3$

(b) $k = 3$

(d) $k < 3$

(vii) Simran had a recurring deposit account in a bank and deposited ₹ 500 per month for $2\frac{1}{2}$ years. If the rate of interest was 10% p.a., then the matured value of this account is:

(a) ₹ 16,397.50

(c) ₹ 16,793.50

(b) ₹ 16,937.50

(d) ₹ 16,973.50

Question 2

- (i) Find the value of k for which the following equation has equal roots: [4]

$$x^2 + 4kx + (k^2 - k + 2) = 0$$

- (ii) If $5 \tan \theta = 4$, find the value of: [4]

$$\frac{5 \sin \theta + 3 \cos \theta}{5 \sin \theta + 2 \cos \theta}$$

- (iii) Using the properties of proportion, solve for x , given [5]

$$\frac{x^4 + 1}{2x^2} = \frac{17}{8}$$

SECTION B (20 marks)

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

Question 3

- (i) Mr. Sonu has a recurring deposit account and deposits ₹ 750 per month for 2 years. If he gets ₹ 19,125 at the time of maturity, find the rate of interest. [3]
- (ii) Prove that: [3]

$$(\operatorname{cosec} \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta) = 1$$

- (iii) Determine the value of p and q if: [4]

$$\begin{bmatrix} 2p+1 & q^2-2 \\ 6 & 0 \end{bmatrix} = \begin{bmatrix} p+3 & 3q-4 \\ 5q-q^2 & 0 \end{bmatrix}$$

Question 4

- (i) Determine the multiplication of the given matrices: [3]

$$\begin{bmatrix} 2 \sin 30^\circ & -2 \cos 60^\circ \\ -\cot 45^\circ & \sin 90^\circ \end{bmatrix} \begin{bmatrix} \tan 45^\circ & \sec 60^\circ \\ \operatorname{cosec} 30^\circ & \cos 0^\circ \end{bmatrix}$$

- (ii) If the mean of the following distribution is 7.5, find the missing frequency f . [3]

Variable (x)	5	6	7	8	9	10	11	12
Frequency (f)	20	17	f	10	8	6	7	6

- (iii) Use factor theorem to factorize $6x^3 + 17x^2 + 4x - 12$ completely. [4]

Question 5

- (i) Without solving the following quadratic equation, find the value of m for which the given equation has real and equal roots. [4]

$$x^2 + 2(m - 1)x + (m + 5) = 0$$

- (ii) The data on the number of patients attending a hospital in a month are given below. Find the average (mean) number of patients attending the hospital in a month by using the shortcut method.

Take the assumed mean as 45. Give your answer correct to 2 decimal places. [6]

Number of patients	Number of days
10 – 20	5
20 – 30	2
30 – 40	7
40 – 50	9
50 – 60	2
60 – 70	5