MATHEMATICS (M015)

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) Naveen deposited ₹ 60 per month in a cumulative (recurring) deposit account for 4 years. The amount he gets at the time of maturity if the rate of interest is 5% per annum is:

(a) ₹ 3,240

(b) ₹ 3,248.48

(c) ₹ 3,238.5

(d) ₹ 3,174

(ii) If $-4 < 2x + 6 < 2, x \in \mathbb{R}$, then x lies in:

(a) $[-4, 6]$

(b) $(-5, -2)$

(c) $[-4, -2]$

(d) $[-5, 6]$

(iii) The roots of $100x^2 - 20x + 1 = 0$ is:

(a) $\frac{1}{20}$ and $\frac{1}{20}$

(b) $\frac{1}{10}$ and $\frac{1}{20}$

(c) $\frac{1}{10}$ and $\frac{1}{10}$

(d) None of these

(iv) If a, b, c and d are in proportion then $\sqrt{\frac{3a^2 + 8b^2}{3c^2 + 8d^2}}$ is equal to:

(a) $\frac{c}{a}$

(b) $\frac{b}{d}$

(c) $\frac{a}{b}$

(d) $\frac{c}{d}$

(v) The matrix $A = \begin{bmatrix} 2\sin 30^\circ & \cos 0^\circ \\ \cos 0^\circ & 2\sin 30^\circ \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$. If $AX = B$, then the order of matrix is:

(a) 1×2

(b) 2×2

(c) 2×1

(d) 1×1

(vi) If the 8^{th} term of G.P. is 192 with a common ration of 2, then the 12^{th} term is:

(a) 1640

(b) 2048

(c) 3072

(d) 31263

(vii) The volume of a conial tent is 462 m^3 and the area of base is 154 m^2. The height of the cone is:

(a) 15 m

(b) 12 m

(c) 9 m

(d) 24 m

Question 2

(i) If the m^{th} term of an A.P. is $\dfrac{1}{n}$ and the n^{th} term is $\dfrac{1}{m}$, show that the sum of mn terms is $\dfrac{1}{2}(mn+1)$. [4]

(ii) Using properties of proportion, solve for x. Given that x is positive: [4]

$$\frac{2x+\sqrt{4x^2-1}}{2x-\sqrt{4x^2-1}}=4$$

(iii) The sum of a number and its positive square root is $\dfrac{6}{25}$. What is the number? [5]

SECTION B (20 marks)

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

Question 3

(i) If $x - \sqrt{2}$ is a factor of $2x^3 - x^2 - Px - 2$, then the value of P is? [3]

(ii) Water is flowing at 7 m/s through a cylindrical pipe of internal diameter 4 cm into a cylindrical tank of radius 40 cm. Calculate the increase in level of water in 30 minutes. [3]

(iii) Given $A = \begin{bmatrix} 2 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $A^2 = 9A + mI$. Find m. [4]

Question 4

(i) Mr. Sonu had a recurring deposit account and he deposited ₹ 750 per month for 2 years. If he gets ₹ 19,125 at the time of maturity, then find the rate of interest. [3]

(ii) For what value of k the equation $x^2 + 4kx + k^2 - k + 2 = 0$ has equal roots? [3]

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

Question 5

(i) Prove that: [4]

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

(ii) Using a graph paper draw a histogram and estimate the mode of the given data. [6]

Marks	No. of students
0 – 10	4
10 – 20	7
20 – 30	12
30 – 40	15
40 – 50	10
50 – 60	8
60 – 70	5
70 – 80	3