MATHEMATICS (M014)

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 $\sin\theta + \sin^2\theta = 1$, then $\cos^2\theta + \cos^4\theta$ is:

(a) 1 (c) 2

(b) $\frac{1}{2}$ (d) 4

(ii) If k, $2(k+1)$, $3(k+1)$ are consecutive terms of a G.P., then the value of k is:

(a) -1 (c) 1

(b) -4 (d) 4

(iii) If 8 times the eighth term of an A.P. is 15 times the fifteenth term, then the 23^{rd} term of the A.P. is:

(a) 0

(c) 23

(b) 22

(d) 15

(iv) Find the value of x and y if:

$$2\begin{bmatrix}3 & 4\\5 & x\end{bmatrix}+\begin{bmatrix}1 & y\\0 & 1\end{bmatrix}=\begin{bmatrix}7 & 0\\10 & 5\end{bmatrix}$$

(a) $x = 4$, $y = -4$

(c) $x = 2$, $y = -4$

(b) $x = 2$, $y = -8$

(d) $x = 4$, $y = -8$

(v) If the sum of two sides, other than hypotenuese of a right-angled triangle is 17 cm and the perimeter is 30 cm, then the lenghts of the other two sides are:

(a) 7 cm, 10 cm

(c) 5 cm, 12 cm

(b) 4 cm, 13 cm

(d) 6 cm, 11 cm

(vi) The solution set of $-2 + 10x \leq 13x + 10 < 24 + 10x, x \in \mathbb{Z}$ is:

(a) { -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 }

(b) { -4, -3, -2, -1, 0, 1, 2, 3, 4 }

(c) { -3, -2, -1, 0, 1, 2, 3, 4 }

(d) { -3, -2, -1, 0, 1, 2, 3, 4, 5 }

(vii) Satyam deposited ₹ 200 per month in a recurring deposit account for 18 months. If the rate of interest is 9% per annum, then the interest earned by him during this period is:

(a) ₹ 3,856.50

(c) ₹ 330

(b) ₹ 3,343.50

(d) ₹ 256.50

Question 2

(i) Given that [4]

$$\tan(\theta_1 + \theta_2) = \frac{\tan\theta_1 + \tan\theta_2}{1 - \tan\theta_1 \tan\theta_2}$$

Determine $(\theta_1 + \theta_2)$, when $\tan\theta_1 = \frac{1}{2}$ and $\tan\theta_2 = \frac{1}{3}$.

(ii) The sum of 4^{th} and 8^{th} terms of an A.P. is 24 and the sum of the 6^{th} and 10^{th} terms is 44. Find the first three terms of the A.P. [4]

(iii) The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. Find the radius and volume of the cylinder. [5]

SECTION B (20 marks)

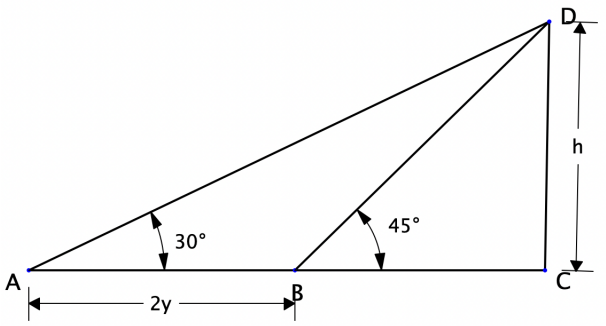
*(Attempt **any two** questions from this **Section**)*

Question 3

(i) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 7 \\ 0 \end{bmatrix}$ find matrix C such that $AC = B$. [3]

(ii) If $ax^3 + 3x^2 + bx - 2$ has a factor $(2x + 3)$ and leave remainder 7 when divided by $(x + 2)$, find the values of a and b. [3]

(iii) The length of a shadow of a tower standing on level plane is found to be $2y$ metres longer when the sun's altitude is 30° than when it was 45°. What is the height of the tower in terms of y. [4]



Question 4

(i) Without solving the following quadratic equation, find the value of p for which the given equation has real and equal roots: [3]

$$x^2 + (p - 3)x + p = 0$$

(ii) Solve the following inequation and represent the solution set on the number line: [3]

$$4x - 19 < \frac{3x}{5} - 2 \leq \frac{-2}{5} + x, x \in \mathbb{R}$$

(iii) How many spherical bullets can be made out of a solid cube of lead whose edge measures 44 cm. Each bullet being 4 cm in diameter. [4]

Question 5

(i) Shekhar has a R.D. account in a bank. He deposits ₹ 800 per month and gets ₹ 798 as interest. If the rate of interest is 8% per annum, then what was the total time for which the account was held? [4]

(ii) Find the mean of the following distribution by step-deviation method: [6]

Class	Frequency (f)
20 – 30	10
30 – 40	6
40 – 50	8
50 – 60	12
60 – 70	5
70 – 80	9