

MATHEMATICS (M017)

Maximum Marks: 50

Time allowed: 90 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 three** 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) Simplify : $[(\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2] \operatorname{cosec}^2 \theta$

(a) $2 \sin^2 \theta$

(c) $2 \cot^2 \theta$

(b) $2 \operatorname{cosec}^2 \theta$

(d) $2 \tan^2 \theta$

(ii) The ratio $\frac{2}{3} : \frac{1}{9}$ in its simplest form is:

(a) 1 : 3

(c) 6 : 1

(b) 2 : 1

(d) 2 : 9

(iii) If $(3x + 2)$ is a factor of the polynomial $3x^3 + 2x^2 - 3x - 2$, then its other factors are:

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

(c) $(x - 1), (x - 3)$

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

(d) $(x - 2), (x - 3)$

(iv) The ratio of the heights of two right circular cones is $3 : 4$ and that of their base radii is $4 : 5$. Find the ratio of their volumes.

(a) $16 : 25$

(c) $4 : 5$

(b) $12 : 25$

(d) $3 : 4$

(v) The point $(2, 3)$ is reflected in the line $x = 4$ to the point P' . Find the co-ordinates of the point P' .

(a) $(4, 3)$

(c) $(6, 3)$

(b) $(-2, 3)$

(d) $(3, 6)$

(vi) If $(x - 2)$ is a factor of the polynomial $x^3 + 2x^2 - 13x + k$, then k is:

(a) -10

(c) -26

(b) 26

(d) 10

(vii) Evaluate: $1 - \frac{\cos^2 \theta}{1 + \sin \theta}$

(a) $\sin \theta$

(c) 1

(b) $\cos \theta$

(d) ∞

Question 2

(i) If third term of a G.P. is 4, determine the product of its first five terms. [4]

(ii) Using the remainder theorem, factorise $x^3 + 10x^2 - 37x + 26$. [4]

(iii) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, determine $A^2 - 5A + 7I$. [5]

SECTION B (30 marks)

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

Question 3

- (i) Solve: $\sin^2 \theta - 3 \sin \theta + 2 = 0$ [3]
- (ii) A father is three times as old as his son. After twelve years his age will be twice as that of the age of his son. Find their present age. [3]
- (iii) The first term of an A.P. is 10, the last term is 50. If the sum of all the terms is 480, find the common difference and the number of terms. [4]

Question 4

- (i) If one root of $2x^2 - px + 4 = 0$ is 2, find the other root and the value of p . [3]
- (ii) Given $A = \begin{bmatrix} p & 0 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -q \\ 1 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 2 & -2 \\ 2 & 2 \end{bmatrix}$ and $BA = C^2$. [3]
Find the value of p and q .
- (iii) The work done by $(x - 3)$ men in $(2x + 1)$ days and the work done by $(2x + 1)$ men in $(x + 4)$ days are in ratio 3 : 10. Determine the value of x . [4]

Question 5

- (i) The ratio between the curved surface area and the total surface area of a cylinder is 1 : 2. Find the height of the cylinder, if its total surface area is 352 cm^2 . [3]
- (ii) Determine the two numbers such that their mean proportional is 24 and the third proportional is 1,536. [3]
- (iii) The sum of the first ten terms of an A.P. is zero, and the sum of the first and second term is 24. Find the first three terms. [4]

Question 6

- (i) Determine the sum of the series [5]

$$x(x + y) + x^2(x^2 + y^2) + x^3(x^3 + y^3) + \dots \text{to } n \text{ terms}$$

- (ii) Prove that: [5]

$$\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = \sec \theta \operatorname{cosec} \theta + 1$$