# MATHEMATICS (M012)

*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) Determine the mean of the following frequency distribution:

| Group | 10-15 | 15-20 | 20-25 |
|---|---|---|---|
| Frequency | 3 | 10 | 2 |

(a) 15.1

(b) 15.17

(c) 17.17

(d) 17.71

(ii) If there are 15 terms in an A.P. whose first term is $\sqrt{2}$ and common difference is $2\sqrt{2}$, then the last term is:

(a) $31\sqrt{2}$ (c) $29\sqrt{2}$

(b) $30\sqrt{2}$ (d) $28\sqrt{2}$

(iii) If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ and $A^2 + xI = yA$, then the value of $x$ is:

(a) -8 (c) 4

(b) -4 (d) 8

(iv) The remainder when $f(x) = x^2 - 4x + 2$ is divided by $2x + 1$, is:

(a) $\frac{1}{4}$ (c) -10

(b) $\frac{17}{4}$ (d) 22

(v) If length of hypotenuse of a right-angled triangle exceeds the length of one side by 2 cm and exceeds twice the length of other side by 1 cm, then the length of hypotenuse of the triangle is:

(a) 17 cm (c) 15 cm

(b) 1 cm (d) 22 cm

(vi) Evaluate: $\sin^2\theta + \tan^2\theta + \cos^2\theta$:

(a) $\sec^2\theta$ (c) 0

(b) 1 (d) $2\sin\theta$

(vii) Tenth term from the end of A.P. 18, 16, 14, ..., -10 is:

(a) 0 (c) -2

(b) 8 (d) 10

**Question 2**

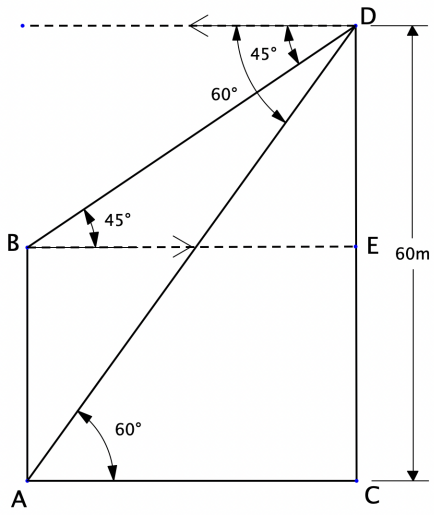
(i) Prove that [4]

$$\sin^2\theta - \cos^4\theta = 1 - 2\cos^2\theta$$

(ii) The mean of the following distribution is 6. Find the value of P. [4]

| Variate (x) | 2 | 4 | 6 | 10 | P+5 |
|---|---|---|---|---|---|
| Frequency (f) | 3 | 2 | 3 | 1 | 2 |

(iii) From the top of a tower 60m high, the angles of depression of the top and bottom of pole are observed to be 45°and 60°respectively. Find the height of the pole. [5]



## SECTION B (20 marks)

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

**Question 3**

(i) If the polynomials $ax^3 + 4x^2 + 3x - 4$ and $x^3 - 4x + a$ leave the same remainder when divided by $(x - 3)$, find the value of $a$. [3]

(ii) The factors of the polynomial $x^3 + 10x^2 - 37x + 26$ are? [3]

(iii) If the $6^{th}$ term of an A.P. is equal to four times its first term and the sum of first six terms is 75, find the first term and the common difference. [4]

**Question 4**

(i) Determine the value of $x$ given that $A^2 = B$, where: [3]

$$A = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix},$$

(ii) Solve the equation $2x - \frac{1}{x} = 7$. [3]

Write your answer correct upto two decimal places.

(iii) A recurring deposit account of ₹ 1,200 per month has a maturity value of ₹ 12,440. If the rate of interest is 3% and the interest is calculated at the end of every month; find the time (in months) of this Recurring Deposit Account. [4]

**Question 5**

(i) Find the value of $a$ and $b$ so that the polynomial $x^3+10x^2-ax+b$ is exactly divisible by $(x - 1)$ as well as with $(x - 2)$. [4]

(ii) If the polynomial $x^3 + ax^2 - bx - 30$ is exactly divisible by $x^2 - 2x - 15$, find $a$ and $b$ and also the third factor. [6]