MATHEMATICS (M019)

Maximum Marks: 64

Time allowed: ***120 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

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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 (34 marks)

(Attempt ***all*** *questions from this* ***Section****)*

Question 1

Choose the correct answers to the questions from the given options. [14]
(Do not copy the questions, write the correct answers only.)

(i) If a dealer in Agra (UP) supplies goods worth ₹ 10,000 to another dealer in Bhopal (MP) with a rate of GST 28%, then the tax levied under CGST is:

(a) ₹ 2,800 (b) ₹ 1,400 (c) ₹ 2,000 (d) Nil

(ii) Ruhi deposited ₹ 200 per month for 15 months in a bank's recurring deposit account. If the bank pays interest at a rate of 10% per annum, then the interest earned by Ruhi during this period is:

(a) ₹ 300 (c) ₹ 200

(b) ₹ 250 (d) ₹ 150

(iii) **Assertion:** If the solution set of $5x + 4 \leq 24$ is $\{1, 2, 3, 4\}$, then the replacement set of x is $\mathbb{N}$.

Reason: In number system, the symbol $\mathbb{N}$ denotes the set of natural numbers i.e., 1, 2, 3, 4.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not the correct explanation of assertion.

c. Assertion is correct but reason is not correct.

d. Assertion is incorrect but reason is correct.

(iv) If a is a natural number and one of the roots of the equation $3x^2 - 14x + 8 = 0$, then the value of a is:

(a) 4 (c) 8

(b) $\frac{2}{3}$ (d) 6

(v) The radii of two cylinders are in the ratio 3 : 7 and their heights of ratio 49 : 5, then find the ratio of their volumes.

(a) 3 : 5 (c) 9 : 5

(b) 5 : 3 (d) 9 : 25

(vi) Ramesh buys some goods worth ₹ 5,000 in the same city. If the rate of GST is 18%, then the amount Ramesh has to pay to buy the goods is:

(a) ₹ 5,000 (c) ₹ 5,450

(b) ₹ 5,560 (d) ₹ 5,900

(vii) A hollow cylinder with inner and outer radii 8 cm and 10 cm respectively is melted and recast into a solid cylinder of the same height. Find the radius of new cylinder.

(a) 6 cm

(c) 3 cm

(b) 4 cm

(d) 2 cm

(viii) The average of n numbers $x_1, x_2, \ldots, x_n$ is K. If we change x_n into x, then the obtained new average is:

(a) $\dfrac{k - x_n + x}{n}$

(c) $\dfrac{nk - x_n + x}{n}$

(b) $\dfrac{kx - x_n}{n}$

(d) None

(ix) If $P'(-4, -3)$ is the image of a point P under reflection in the origin, the coordinate of P is:

(a) $(4, 3)$

(c) $(-4, -3)$

(b) $(4, -3)$

(d) $(-4, 3)$

(x) The duplicate ratio of $\sqrt{3} : 7$ is:

(a) $3 : 49$

(c) $2\sqrt{3} : 14$

(b) $7 : \sqrt{3}$

(d) $(\sqrt{3} + 2) : 9$

(xi) When the polynomial $x^3 + 2x^2 - kx + 4$ is divided by $x - 2$, the remainder is k. The value of k is:

(a) -10

(c) $\dfrac{20}{3}$

(b) $\dfrac{-20}{3}$

(d) 20

(xii) The number of terms of an A.P. 5, 9, 13, ... 185 is:

(a) 45

(c) 41

(b) 46

(d) 50

(xiii) If $x = 2$ and $x = 3$ are the roots of the equation $3x^2 - 2mx + 2n = 0$, then the values of m and n respectively are:

(a) $\frac{15}{2}, 9$

(b) $15, 7$

(c) $9, 15$

(d) $7, 13$

(xiv) Katrina opened a R.D. account with a Nationalised bank for a period of two years. If the bank pays interest at the rate of 6% per annum and monthly instalment is ₹ 1,000, then the interest earned in one year is:

(a) ₹ 360

(b) ₹ 390

(c) ₹ 450

(d) ₹ 500

Question 2

(i) The raidus and height of a cylinder are in the ratio $5 : 7$ and its volume is 550 cm^3. Find its radius. (Take $\pi = \frac{22}{7}$) [3]

(ii) Choose the right option: [3]

Assertion: Let $A = \begin{bmatrix} 2 & 3 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} m-n & 6 \\ 14 & m+n \end{bmatrix}$. If $2A = B$, then $m = 7$ and $n = 3$.

Reason: Two eaual matrics have the same order and their corresponding elements are also equal.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not the correct explanation of assertion.

c. Assertion is correct but reason is not correct.

d. Assertion is incorrect but reason is correct.

(iii) The mean of the following data is 16. Calculate the value of f. [4]

Marks	5	10	15	20	25
No. of Students	3	7	f	9	6

Question 3

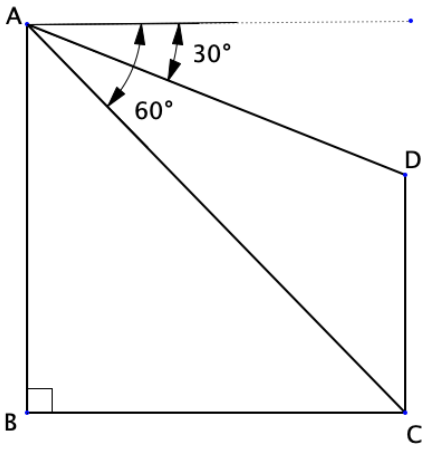
(i) Using remainder theorem factorize the following expression: [3]

$$3x^3 + 10x^2 + x - 6$$

(ii) The difference of two natural numbers is 7 and their product is 450. [3]
Find the numbers.

(iii) In the figure given, from the top of a building $AB = 60$ m high, the angles of depresssion of the top and bottom of a vertical lamp post CD are observed to be 30°and 60°respectively. Find: [4]

- The horizontal distance between AB and CD
- The height of the lamp post.



SECTION B (30 marks)

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

Question 4

(i) Find the solution set of the following inequalities and draw the graph of their solution sets: [3]

$$\frac{3}{|x-2|} > 5, x \in \mathbb{R}$$

(ii) Find two consecutive positive even integers whose squares have the sum 340. [3]

(iii) Divide ₹ 720 between Sunil, Sohil and Akhil, so that Sunil gets $\frac{4}{5}$ of Sohil's and Akhil's share together and Sohil gets $\frac{2}{3}$ of Akhil's share. [4]

Question 5

(i) Solve the quadratic equation: [3]

$$3a^2x^2 + 8abx + 4b^2 = 0$$

(ii) Prove the identity: [3]

$$\frac{1-\cos\theta}{1+\cos\theta} = (\cot\theta - \text{cosec }\theta)^2$$

(iii) Determine the n^{th} term of the sequence [4]

$$\log(a),\ \log(ab),\ \log\left(ab^2\right),\ \log\left(ab^3\right),\ \ldots$$

Question 6

(i) Find the sum of the first 8 terms of the following series: [3]

$$1,\ \sqrt{3},\ 3,\ \ldots$$

(ii) Solve the following inequalities: [3]

$$2x - 5 \leq 5x + 4 < 11,\ x \in \mathbb{I}$$

(iii) Using graph paper, plot the points $A(6, 4)$ and $B(0, 4)$. Reflect A and B in the origin to get images A' and B'. Find the perimeter of figure $ABA'B'$. [4]

Question 7

(i) Choose the right option: [4]

Assertion: Mrs. Mehta has a cululative time deposit account in a bank. She deposits ₹ 600 per month for 6 years and received ₹ 53,712 at the end of maturity period. Then the rate of interest is 8% per annum.

Reason: The maturity value of a R.D. account includes the amount deposited by the accoutn holder together with teh interest compounded quarterly at a fixed rate.

a. Both assertion and reason are correct and reason is the correct explanation of assertion.

b. Both assertion and reason are correct but reason is not the correct explanation of assertion.

c. Assertion is correct but reason is not correct.

d. Assertion is incorrect but reason is correct.

(ii) A wholesaler buys a TV from the manufacturer for ₹ 25,000. He marks the price of the TV 20% above his cost price and sells it to a retailer at a 10% discount on the marked price. If the rate of GST is 8%, find: [6]

(a) Marked price

(b) Retailer's cost price inclusive of tax

(c) GST paid by the wholesaler