

# HALF YEARLY EXAMINATION -2025

## MATHEMATICS

Reg No. \_\_\_\_\_

MARKS: 100

10 Std

Time : 2.30 HR

**Instructions:**

- ❖ Write clearly and legibly without mistakes and overwriting utilising the maximum time allotted for the exam.
- ❖ Answers should be in your own style without changing the main core concept.
- ❖ Use only black or blue ink pen to write the exam.
- ❖ Draw clear diagrams wherever necessary.

**PART - A****14 X1=14****I Choose the correct answer.**

1. If there are 1024 relations from a set  $A = \{1, 2, 3, 4, 5\}$  to a Set B, then the number of elements in B is
  - a) 3
  - b) 2
  - c) 4
  - d) 8
2.  $f(x) = (x+1)^3 - (x-1)^3$  represents a function which is
  - a) linear
  - b) Cubic
  - c) reciprocal
  - d) quadratic
3. If the HCF of 65 and 117 is expressible in the form of  $65m - 117$ , then the value of m is
  - a) 4
  - b) 2
  - c) 1
  - d) 3
4. The sum of first n terms of a G.P is not applicable when  $r=1$ , then  $S_n$  is .....
  - a)  $\frac{a(r^n - 1)}{r - 1}$
  - b)  $\frac{a(1 - r^n)}{1 - r}$
  - c) na
  - d) None of these
5. Which of the following should be added to make  $x^4 + 64$  a perfect square
  - a)  $4x^2$
  - b)  $16x^2$
  - c)  $8x^2$
  - d)  $-8x^2$
6. If A is a  $2 \times 3$  matrix and B is a  $3 \times 4$  matrix, how many columns does AB have
  - a) 3
  - b) 4
  - c) 2
  - d) 5
7. If in  $\Delta ABC$ ,  $DE \parallel BC$ ,  $AB = 3.6\text{cm}$ ,  $AC = 2.4\text{cm}$  and  $AD = 2.1\text{cm}$  then the length of AE is
  - a) 1.4cm
  - b) 1.2 cm
  - c) 1.8cm
  - d) 1.05 cm
8. If  $(5, 7)$ ,  $(3, P)$  and  $(6, 6)$  are collinear, then the value of p is
  - a) 3
  - b) 6
  - c) 9
  - d) 12
9. When proving that a quadrilateral is a trapezium it is necessary to show
  - a) two sides are parallel
  - b) Two parallel and two non-parallel sides
  - c) opposite sides are parallel
  - d) All sides are of equal length

10. A tower is 60m high. Its shadow reduces by  $x$  meters when the angle of elevation of the sun increases from  $30^\circ$  to  $45^\circ$  then  $x$  is equal to  
 a) 41.92 m      b) 43.92 m      c) 43 m      d) 45.6 m
11. CSA of solid sphere is equal to  
 a) T.S.A of solid sphere      b) TSA of hemisphere  
 c) CSA of hemisphere      d) none of these
12. In a hollow cylinder, the sum of the external and Internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is  
 a)  $5600\pi \text{ cm}^3$       b)  $11200\pi \text{ cm}^3$       c)  $56\pi \text{ cm}^3$       d)  $3600\pi \text{ cm}^3$
13. The range of the data 8, 8, 8, 8, 8 ..... 8 is  
 a) 0      b) 1      c) 8      d) 3
14. Which of the following is incorrect?  
 a)  $P(A) > 1$       b)  $0 \leq P(A) \leq 1$       c)  $P(\emptyset) = 0$       d)  $P(A) + P(\bar{A}) = 1$

### PART - B

#### II Answer any ten questions. (Q.No.28 is Compulsory)

10x2=20

15. Let  $A = \{1, 2, 3\}$  and  $B = \{x / x \text{ is a prime number less than } 10\}$  Find  $A \times B$
16. Find  $K$  if  $f \circ f(k) = 5$ , where  $f(k) = 2k - 1$
17. The general term of a sequence is  $a_n = \frac{5n}{n+2}$ , then find  $a_6$  and  $a_{13}$ .
18. Find the LCM of  $p^2-3p+2$ ,  $p^2-4$
19. Determine the nature of roots for the quadratic equation  $9x^2 - 24x + 16 = 0$

20. If  $A = \begin{bmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{bmatrix}$  then find the transpose of  $-A$

21. A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point.
22. Show that the points  $P(-1.5, 3)$ ,  $Q(6, -2)$ ,  $R(-3, 4)$  are collinear.
23. Find the slope and y intercept of  $\sqrt{3}x + (1 - \sqrt{3})y = 3$

24. Prove that  $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \csc\theta + \cot\theta$ .

25. Find the diameter of a sphere whose surface area is  $154 \text{ m}^2$
26. Find the range and coefficient of range of the following data 25, 67, 48, 53, 18, 39, 44.
27. What is the probability that a leap year selected at random will contain 53 saturdays.
28. Find the 4-digit pin number pqrs of an ATM card such that  $p^2 \times q^1 \times r^4 \times S^3 = 315000$

### PART - C

#### III Answer any ten of the following questions. (Q.No.42 is Compulsory) 10x5=50

29. Let  $A = \{x \in N / 1 < x < 4\}$ ,  $B = \{x \in w / 0 \leq x < 2\}$  and  $C = \{x \in N / x < 3\}$  then verify that  $A \times (B \cap C) = (A \times B) \cap (A \times C)$
30. Let  $f: A \rightarrow B$  be a function defined by  $f(x) = \frac{x}{2} - 1$  where  $A = \{2, 4, 6, 10, 12\}$ ,  $B = \{0, 1, 2, 4, 5, 9\}$   
Represent f by  
 i) Set of ordered pairs    ii) a table    iii) an arrow diagram    iv) a graph
31. The sum of three consecutive terms that are in A.P is 27 and their product is 288. Find the three terms.
32. Find the sum to n terms of the series  $7+77+777+ \dots$
33. If  $A = \frac{2x+1}{2x-1}$ ,  $B = \frac{2x-1}{2x+1}$ , find  $\frac{1}{A-B} - \frac{2B}{A^2-B^2}$
34. Find the square root of  $64x^4 - 16x^3 + 17x^2 - 2x + 1$
35. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  show that  $A^2 - 5A + 7I_2 = 0$
36. State and prove pythagoras theorem
37. Find the area of the quadrilateral whose vertices are at  $(-9, -2)$ ,  $(-8, -4)$ ,  $(2, 2)$  and  $(1, -3)$
38. A  $(-3, 0)$ , B  $(10, -2)$  and C  $(12, 3)$  are the vertices of  $\Delta ABC$ , Find the equation of the altitude through A and B.
39. From the top of a 12 m high building the angle of elevation of the top of a cable tower is  $60^\circ$  and the angle of depression of its foot is  $30^\circ$ . Determine the height of tower.
40. The marks scored by 10 students in a class test are 25, 29, 30, 33, 35, 37, 38, 40, 44, 48. Find the standard deviation.
41. A coin is tossed thrice. Find the probability of getting exactly two heads or atleast one tail or consecutive two heads.
42. A Capsule is in the shape of a cylinder with two hemisphere stuck to each of its ends. If the length of the entire capsule is 12 mm and the diameter of the capsule is 3mm, How much medicine it can hold?

**PART - D****IV Answer all the Questions.****2x8=16**

43. a) Draw a triangle ABC of base BC=8cm,  $\angle A=60^\circ$  and the bisector of  $\angle A$  meets BC at D such that BD=6cm.

**[OR]**

- b) Draw the two tangents from a point which is 5cm away from the centre of a circle of diameter 6 cm Also, measure the lengths of the tangents.

44. a) Draw the graph of  $xy = 24, x, y > 0$ , Using the graph find

- i) y when  $x=3$  and      ii) x when  $y=6$

**[OR]**

- b) Draw the graph of  $y = x^2 - 4x + 3$  and use it to solve  $x^2 - 6x + 9 = 0$