

SECOND MID TERM TEST - 2024

Standard X

Reg.No.

MATHEMATICS

Marks : 50

7 x 1 = 7

Time : 1.30 hrs

Part - I

I. Choose the correct answer:

1. If 'A' is a 2 x 3 matrix, and 'B' is a 3 x 4 matrix, how many columns does AB have?
 a) 3 b) 4 c) 2 d) 5

2. Find the matrix 'X' if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$

- a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

3. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure
 a) 45° b) 30° c) 90° d) 60°

4. A tower is 60 m height. Its shadow reduces by 'x' metres. When the angle of elevation of the sun increases from 30° to 45° , then 'x' is equal to _____
 a) 41.92 m b) 43.92 m c) 43 m d) 45.6 m

5. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be _____
 a) 12 cm b) 10 cm c) 13 cm d) 5 cm

6. The curved surface area of right circular cone of height 15 cm and base diameter 16 cm is _____
 a) $60\pi \text{ cm}^2$ b) $68\pi \text{ cm}^2$ c) $120\pi \text{ cm}^2$ d) $136\pi \text{ cm}^2$

7. Graph of a quadratic equation is a _____
 a) straight line b) circle c) parabola d) hyperbola

Part - II

II. Answer any 5 questions. (Q.No.14 is compulsory)

5 x 2 = 10

8. Construct a 3 x 3 matrix, whose elements are given by $a_{ij} = |i - 2j|$

9. If $A = \begin{pmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{pmatrix}$ $B = \begin{pmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{pmatrix}$, verify $A + B = B + A$

10. A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.

11. From the top of a tree of height 13 m, the angle of elevation and depression of the top and bottom of another tree are 45° and 30° respectively. Find the height of the second tree. ($\sqrt{3} = 1.732$)

12. If the total surface area of a cone of radius 7 cm and 704 cm^2 . Find its slant height.

13. Find the diameter of a sphere whose surface area is 154 cm^2

14. If $A = \begin{pmatrix} 1 & 4 & 9 \\ 4 & 16 & 36 \\ 9 & 36 & 81 \end{pmatrix}$, show that $(A^T)^T = A$

Part - III

III. Answer any 5 questions. (Q.No.21 is compulsory)

5 x 5 = 25

15. Define the following matrices with examples.

- Diagonal matrix of 3×3 order. (2 marks)
- Scalar matrix of 4×4 order. (2 marks)
- Identity matrix of 3×3 order. (1 mark)

16. If $A = \begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix}$ $B = \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$, then find $2A + B$

17. If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$ $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$ $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$, verify that $A(B + C) = AB + AC$

18. Two ships are sailing in the sea, on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively.

If the lighthouse is 200 m height, find the distance between the two ships. ($\sqrt{3} = 1.732$)

19. A statue 1.6 m tall stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 40° . Find the height of the pedestal.

($\tan 40^\circ = 0.8391$, $\sqrt{3} = 1.732$)

20. The radius and height of a cylinder are in the ratio 5:7 and its curved surface area is 5500 cm^2 . Find its radius and height.

21. a) If the radii of a circular ends of a frustum which is 45 cm high are 28 cm and 7 cm. Find the volume of a frustum.

(OR)

b) State and prove Pythagoras Theorem.

Part - IV

IV. Answer any one of the following.

1 x 8 = 8

22. a) Draw the graph of $x^2 - 9x + 20 = 0$ and state the nature of their solutions.

(OR)

b) Take a point which is 11 cm away from the centre of a circle of radius 4 cm and draw two tangents to the circle from that point.
