Class:10

SECOND MID TERM TEST - 2024

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MATHEMATICS

Time Allowed : 1.30 Hours]   [Max. Marks : 50

PART - I

I. Choose the correct Answer.   7x1=7

1. The number of Points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the x axis is

   a) 0   b) 1   c) 0 or 1   d) 2

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 $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$ $B = \begin{pmatrix} 1 & 1 \\ 2 & -1 \\ 0 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 0 & 1 \\ -2 & 5 \end{pmatrix}$ which of the following statements are correct?

   i) $AB+C = \begin{pmatrix} 5 & 5 \\ 5 & 5 \end{pmatrix}$ (ii) $BC = \begin{pmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{pmatrix}$ (iii) $BA+C = \begin{pmatrix} 2 & 5 \\ 3 & 0 \end{pmatrix}$ (iv) $(AB)C = \begin{pmatrix} -8 & 20 \\ -8 & 13 \end{pmatrix}$

   a)   (i) and (ii) only   b)   (ii) and (iii) only   c)   (iii) and (iv) only   d) all of these

4. A tower is 60m heigh. Its shadow is x metres shorter when the sun's altitude is 45° than when it has been 30°, then x is equal to

   a)   41.92m   b)   43.92m   c)   43m   d)   45.6m

5. The two tangents from an external points P to a circle with centre O are PA and PB. If $\angle APB = 70°$ then the value of $\angle AOB$ is _____

   a)   100°   b)   110°   c)   120°   d)   130°

6. The angle of depression of the top and bottom of 20m tall building from the top of a multistoried building are 30° and 60° respectively. The height of the multistoried building and the distance between two building (in metres) is

   a)   20, $10\sqrt{3}$ b)   30, $5\sqrt{3}$ c)   20, 10   d)   30, $10\sqrt{3}$

7. If the height of the building and distance from the building foot's to a point is increased by 50% then the angle of elevation on the top of the building

   a)   Increases   b)   Decreases   c)   Do not change   d)   Increase 50%

PART - II

II. Answer any five questions only. [Q.No. 14 is compulsory].   5x2=10

8. If $A = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & 5/2 \\ 8 & 3 & 1 \end{pmatrix}$ then verify $(A^T)^T = A$.

TPR / J/10 / Mat / 1

9. Construct a 3 x 3 matrix whose elements are $a_{ij} = i^2j^2$

10. State Ceva's Theorem.

11. Find the length of the tangent drawn from a point whose distance from the centre of a circle is 5cm and radius of the circle is 3cm.

12. A kite is flying at a height of 75m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

13. A tower stands vertically on the ground. From a point on the ground, which is 48m 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.

14. Define square matrix with example.

PART - III

III. Answer any Five questions. Q.No. 21 is compulsory.   5x5=25

15. If A = $(1 \quad -1 \quad 2)$, B = $\begin{pmatrix} 1 & -1 \\ 2 & 1 \\ 1 & 3 \end{pmatrix}$ and C= $\begin{pmatrix} 1 & 2 \\ 2 & -1 \end{pmatrix}$ show that (AB)C = A(BC).

16. Find x and y if $x\begin{pmatrix} 4 \\ -3 \end{pmatrix} + y\begin{pmatrix} -2 \\ 3 \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$

17. If A = $\begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and B = $\begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$

18. If A = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and I = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ Show that $A^2 - (a+d)A = (bc - ad)I_2$.

19. Show that in a triangle, the medians are concurrent.

20. As observed from the top of a 60m high lighthouse from the sea level, the angles of depression of two ships are 28° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (tan 28° = 0.5317)

21. Given A = $\begin{pmatrix} p & 0 \\ 0 & 2 \end{pmatrix}$, B = $\begin{pmatrix} 0 & -q \\ 1 & 0 \end{pmatrix}$, c = $\begin{pmatrix} 2 & -2 \\ 2 & 2 \end{pmatrix}$ and if BA = C², find p and q.

PART - IV

IV. Answer the following Question.   1x8=8

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

(OR)

Draw a circle of diameter 6cm from a point P, Which is 8cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.

TPR / J/10 / Mat / 2