Ramanujam Tuition Centre - Pattimuniam
Thiruvarur (DT) - Question Paper

SECOND MID TERM TEST - 2024

Standard X

MATHEMATICS

Part - I

Marks : 80

Time : 1.30 hrs

7 x 1 = 7

I. **Choose the correct answer:**

1. If number of columns and rows are not equal in a matrix, then it is said to be a
   a) Diagonal matrix   b) Rectangular matrix
   c) Square matrix   d) Identity matrix

2. For the given matrix $A = \begin{bmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{bmatrix}$ the order of the matrix A^T is
   a) 2×3 b) 3×2 c) 3×4 d) 4×3

3. How many tangents can be drawn to the circle from an exterior point?
   a) One   b) Two   c) infinite   d) Zero

4. A tangent is perpendicular to the radius at the
   a) Centre   b) Point of contact   c) Infinity   d) Chord

5. 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) $60°$

6. If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface area of this new solid is
   a) $4\pi r^2$ sq.units   b) $6\pi r^2$ sq.units   c) $3\pi r^2$ sq.units   d) $8\pi r^2$ sq.units

7. 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

Part - II

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

5 x 2 = 10

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

9. If $A = \begin{bmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{bmatrix}$, $B = \begin{bmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{bmatrix}$, then show that $A^2 + B^2 = I$

10. Find the values of x, y, z if (i) $\begin{pmatrix} x - 3 & 3x - z \\ x + y + 7 & x + y + z \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 1 & 6 \end{pmatrix}$

11. A kite is flying at a height of 75 m 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.

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12. Find the angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of a tower of height $10\sqrt{3}$ m.

13. Find the diameter of a sphere whose surface area is 154 m².

14. State the Menelaus Theorem without proof.

Part - III

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

$5 \times 5 = 25$

15. If $A = \begin{pmatrix} 4 & 3 & 1 \\ 2 & 3 & -8 \\ 1 & 0 & -4 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 9 & 2 \\ -7 & 1 & -1 \end{pmatrix}$ and $C = \begin{pmatrix} 8 & 3 & 4 \\ 1 & -2 & 3 \\ 2 & 4 & -1 \end{pmatrix}$ then verify that

$A + (B + C) = (A + B) + C$

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

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

18. A TV tower stands vertically on a bank of a canal. The tower is watched from a point on the other bank directly opposite to it. The angle of elevation of the top of the tower is 58°. From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the canal. (tan 58° = 1.6003)

19. A girl wishes to prepare birthday caps in the form of right circular cones for her birthday party, using a sheet of paper whose area is 5720 cm², how many caps can be made with radius 5 cm and height 12 cm.

20. An industrial metallic bucket is in the shape of the frustum of a right circular cone whose top and bottom diameters are 10 m and 4 m and whose height is 4 m. Find the curved and total surface area of the bucket.

21. State and Prove Pythagoras theorem.

Part - IV

IV. Answer any one.

$1 \times 8 = 8$

22. a) Draw the graph of $y = x^2 - 4$ and hence solve $x^2 - x - 12 = 0$.

(OR)

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

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