SECOND MIDTERM TEST – 2023

X - STD Mathematics

Time: 1.30 Hrs. Maximum Marks – 50

PART – I (Marks - 7)

Note: Answer ALL questions: - 7 x 1 = 7

1. If $A=\begin{pmatrix}1 & -2 & 3\end{pmatrix}$ and $B=\begin{pmatrix}-1\\2\\-3\end{pmatrix}$ then, $A+B=$

   (A) $\begin{pmatrix}0 & 0 & 0\end{pmatrix}$ (B) $B=\begin{pmatrix}0\\0\\0\end{pmatrix}$ (C) (-14) (D) Not define

2. Transpose of a column matrix is .

   (A) unit matrix (B) diagonal matrix (C) column matrix (D) row matrix

3. How many tangents can be drawn to the circle from an exterior point?

   (A) one (B) two (C) infinite (D) zero

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

   (A) 41.92 m (B) 43.92 m (C) 43 m (D) 45.6 m

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) 45^0 (B) 30^0 (C) 90^0 (D) 60^0

6. The base area and height of the hemisphere and the cone are equal. Then the ratio of its curved surface area is

   (A) 1 : 2 (B) 2 : 1 (C) $1:\sqrt{2}$ (D) $\sqrt{2}:1$

7. The total surface area of a hemi-sphere is how much times the square of its radius.

   (A) π (B) 4π (C) 3π (D) 2π

PART – II (Marks - 10)

Note: Answer any FIVE questions. Question Number 14 is compulsory: - 5 x 2 = 10

8. If a matrix has 30 elements, what are the possible orders it can have?

9. If $A=\begin{pmatrix}5 & 2 & 2\\-\sqrt{17} & 0.7 & \frac{5}{2}\\8 & 3 & 1\end{pmatrix}$ then, find $\left(A^T\right)^T$

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

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.

12. A man goes 18 m due east and then 24 m due north. Find the distance of his current position from the starting point?

13. The radius of a spherical balloon increases from 12 cm to 16 cm as air being pumped into it. Find the ratio of the surface area of the balloons in the two cases.

14. A garden roller whose length is 3 m long and whose diameter is 2.8 m is rolled to level a garden. How much area will it cover in 8 revolutions?

PART – III (Marks - 25)

Note: Answer any FIVE questions. Question Number. 21 is compulsory: - **5 x 5 = 25**

15. If $A=\begin{pmatrix}5 & 2 & 9\\ 1 & 2 & 8\end{pmatrix}$ and $B=\begin{pmatrix}1 & 7\\ 1 & 2\\ 5 & -1\end{pmatrix}$ then, verify that $(AB)^T = B^T A^T$

16. If $A=\begin{pmatrix}3 & 1\\ -1 & 2\end{pmatrix}$ then show that $A^2-5A+7I_2=0$

17. In the adjacent figure, ABC is a right-angled triangle with right angle at B and points D, E trisect BC. Prove that $8AE^2 = 3AC^2+5AD^2$

18. From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be 30° and 60°. If the height of the lighthouse is h meters and the line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m.

19. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.

20. The frustum shaped outer portion of the table lamp has to be painted including the top part. Find the total cost of painting the lamp if the cost of painting 1 sq.cm is ` 2.

21. Sate and prove Pythagoras theorem

PART - IV (Marks- 8)

Note: Answer any one question: - **1 x 8 = 8**

22. **(A).** Draw a circle of diameter 10 cm from a point P, which is 10 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths

OR

(B). Draw the graph of $y=x^2-5x-6$ and hence solve $x^2-5x-14=0$