## SECOND MIDTERM TEST – 2023

## Mathematics Time: 1.30 Hrs. YouTube/ Akwa Academy Maximum Marks - 50

PART - I (Marks - 7)

Note: Answer ALL questions: -

 $7 \times 1 = 7$ 

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

(B) 
$$B = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

(D) Not define

- Transpose of a column matrix is
  - (A) unit matrix
- (B) diagonal matrix (C) column matrix (D) row matrix

- How many tangents can be drawn to the circle from an exterior point? 3.
  - (A) one
- (B) two
- (C) infinite
- (D) zero
- A tower is 60 m height. Its shadow is x meters shorter when the sun's altitude is 45° than when it has been  $30^{\circ}$ , then x is equal to
  - (A) 41.92 m
- (B) 43.92 m
- (C) 43 m
- (D) 45.6 m
- 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)  $30^{\circ}$

- 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)  $\sqrt{2}:1$
- The total surface area of a hemi-sphere is how much times the square of its radius.
- (B)  $4\pi$
- (C)  $3\pi$
- (D) 2π

PART - II (Marks - 10)

Note: Answer any FIVE questions. Question Number 14 is compulsory: -

 $5 \times 2 = 10$ 

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  $(A^T)^T$ 

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√3 m 10 - Maths Page -1

- 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?

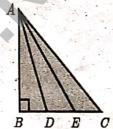
Note: Answer any FIVE questions. Question Number. 21 is compulsory: -

$$5 \times 5 = 25$$

**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

Scm Scm 12cm

## PART - IV (Marks-8)

Note: Answer any one question: -

$$1 \times 8 = 8$$

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  $x^2 - 5x - 14 = 0$ 

10 - Maths Page -2