HOLY MOTHER MATRICULATION SCHOOL - MELAKANAVAI

MONTHLY TEST - OCTOBER - 2022

CLASS : X

SUBJECT: MATHEMATICS

MARKS : 100

TIME : 3:00 hrs

PART-A

I. Choose the correct answer from the given four alternatives and write the option code with the corresponding answer 14×1=14

1. Sum and product of roots of equation $x^2+7x+10$ is
(a) 7, −10 (b) −7, 10 (c) −7, −10 (d) 7, 10

2. Graph of a quadratic equation is
(a) straight line (b) circle (c) Parabola (d) Hyperbola

3. If the roots of the equation $q^2x^2+p^2x+r^2=0$ are the squares of the roots of the equation $qx^2+px+r=0$ then q, p, r are in ___
(a) A.P (b) G.P (c) Both A.P and G.P (d) none of these

4. Transpose of a column matrix is ___ matrix
(a) unit (b) diagonal (c) column (d) row

5. The null matrix is the ___ for matrix addition
(a) inverse (b) identity (c) null (d) scalar

6. Total No. of entries in the matrix $A=(a_{ij})_{m\times n}$ is ___
(a) $m+n$ (b) $m-n$ (c) $\frac{m}{n}$ (d) mn

7. Find the matrix x if $2x+\begin{bmatrix}1 & 3\\ 5 & 7\end{bmatrix}=\begin{bmatrix}5 & 7\\ 9 & 5\end{bmatrix}$
(a) $\begin{bmatrix}-2 & -2\\ 2 & -1\end{bmatrix}$ (b) $\begin{bmatrix}2 & 2\\ 2 & -1\end{bmatrix}$ (c) $\begin{bmatrix}1 & 2\\ 2 & 2\end{bmatrix}$ (d) $\begin{bmatrix}2 & 1\\ 2 & 2\end{bmatrix}$

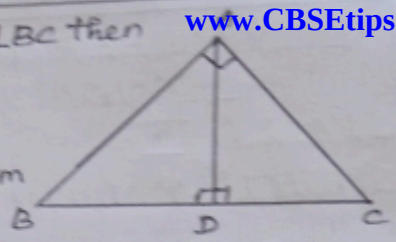
8. If A is order $p\times q$ and B is of order $q\times r$ what is the order of AB
(a) $p\times q$ (b) $q\times r$ (c) $p\times r$ (d) $r\times p$

9. A matrix in which numbers of rows is equal to number of columns is called a ___ matrix
(a) diagonal (b) row (c) column (d) square

10. Two poles of height 6m and 11m stand vertically on a plane ground. If the distance between their feet is 12m, what is the distance between their tops (a) 13 m (b) 14m (c) 15 m (d) 12.8 m

11. A tangent is perpendicular to the radius at the
(a) centre (b) point of contact (c) infinity (d) chord

12. In the adjacent figure $\angle BAC = 90^\circ$ and $AD \perp BC$ then



(a) $BD.CD = BC^2$ (b) $AB.AC = BC^2$

(c) $BD.CD = AD^2$ (d) $AB.AC = AD^2$

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

(a) one (b) Two (c) Infinite (d) zero

14. The first theorem is Mathematics is ——

(a) ABT (b) BPT (c) Pythagorns theroem (d) Alternative segment Theorem

PART - B

ANSWER 10 Questions (Q.NO: 28 is compulsory) [10×2=20]

15. The product of Kumaran's age (in years) two years ago and his age four years from now is one more than twice his present age. What is his present age?

16. Determine the nature roots for $2x^2 - 2x + 9 = 0$

17. Find the values of 'k' for which the quadratic equation are real and equal
$(5k-6)x^2 + 2kx + 1 = 0$

18. If α and β are the roots of $2x^2 - 7x + 5 = 0$ find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

19. Construct a 3×3 matrix whose elements ~~are~~ is $a_{ij} = |i-2j|$

20. If $A = \begin{bmatrix} 5 & 3 & -1 \\ 2 & 8 & 9 \\ -4 & 7 & 5 \end{bmatrix}$ then Verify $(A^T)^T = A$

21. Find the values of x, y and z from the following equation is $\begin{bmatrix} x+y+z \\ x+y \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

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

22. If $A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$ Find AB and BA. Check if AB = BA

23. If $\cos\theta \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \times \sin\theta \begin{bmatrix} x & -\cos\theta \\ \cos\theta & x \end{bmatrix} = I_2$ find x

24. If a matrix has 24 elements, what are the possible orders it can have?

25. A has 'a' rows and 'a+3' columns. B has 'b' rows and 17-b columns, and if both Products AB and BA exist find a, b?

26. What length of ladder is needed to reach a height of 7 ft along the wall when the base of ladder is 4ft from the wall? Round off your answer to the next tenth place

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

28. P and Q are the mid points of the sides CA and CB respectively of a ΔABC, right angled at C. Prove that $4(AQ^2+BP^2) = 5AB^2$

PART-C

Answer 10 questions : (Q: NO: 42 is Compulsory) $\boxed{10\times5=50}$

29. A bus covers a distance of 90km at a uniform speed. Had the speed been 15 km/hour more it would have taken 30 minutes less for the journey. Find the original speed of the bus.

30. Prove that the equation $x^2(p^2+q^2)+2x(pr+qs)+r^2+s^2=0$ has no real roots. If $ps=qr$ then show that the roots are real and equal.

31. If α, β are the roots of the equation $2x^2-x-1=0$, then form the equation whose roots are (i) $\frac{1}{\alpha}, \frac{1}{\beta}$ (ii) $\alpha^2\beta, \beta^2\alpha$

32. Find x and y if $X+Y=\begin{bmatrix}7&0\\3&5\end{bmatrix}$ and $X-Y=\begin{bmatrix}3&0\\0&4\end{bmatrix}$

33. If $A=\begin{bmatrix}4&1&2\\1&-2&3\\0&3&2\end{bmatrix}$ $B=\begin{bmatrix}2&0&4\\6&2&8\\2&4&6\end{bmatrix}$ and $C=\begin{bmatrix}1&2&-3\\5&0&2\\1&-1&1\end{bmatrix}$ then verify that $A+(B+C)=(A+B)+C$

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

35. If $A=\begin{bmatrix}4&2\\-1&1\end{bmatrix}$ then find $(A-2I)(A-3I)$ When I is a 2x2 identity matrix

36. Let $A=\begin{bmatrix}1&2\\1&3\end{bmatrix}$ $B=\begin{bmatrix}4&0\\1&5\end{bmatrix}$ $C=\begin{bmatrix}2&0\\1&2\end{bmatrix}$ show that $A(BC)=(AB)C$

37. If $A=\begin{bmatrix}1&-4\\-2&3\end{bmatrix}$ and $B=\begin{bmatrix}-1&6\\3&-2\end{bmatrix}$ then prove that $(A+B)^2 \neq A^2+2AB+B^2$

38. State and Prove "Baudhyana Theorem"

39. The hypotenuse of a right triangle is 6m more than twice of the shortest side. If the third side is 2m less than the hypotenuse find the sides of the triangle

40. The perpendicular PS on the base QR of a ΔPQR intersects QR at S, such that $QS = 3SR$ Prove that $2PQ^2 = 2PR^2 + QR^2$

41. An Aeroplane leaves an airport and flies due north at a speed of 1000 km/hr. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km/hr. How far apart will be the two planes after $1\frac{1}{2}$ hrs?

42. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ then show that $A^2 - 4A + 5I_2 = 0$

PART - D

Answer both questions $2 \times 8 = 16$

43. a) Draw a circle of diameter 6cm 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

(or)

(b) Draw a circle of radius 4.5 cm. Take a point on the circle. Draw the tangent at the point using the alternate segment theorem

44 (a) Graph the following quadratic equation and state its nature of solutions $x^2 - 6x + 9 = 0$

(or)

(b) Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$

—x—