SECOND MID-TERM TEST - 2022
Standard - XI

Time : 1.30 hrs   **MATHS**   **Marks: 45**

I. Choose the correct answer for all the questions:-   10×1=10

1) If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$ then for what value of λ, $A^2=0$

   a) 0   b) ±1   c) −1   d) 1

2) What must be the matrix X, if $2x + \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} 3 & 8 \\ 7 & 2 \end{pmatrix}$

   a) $\begin{pmatrix} 1 & 3 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 1 & -3 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 2 & 6 \\ 4 & -2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & -6 \\ 4 & -2 \end{pmatrix}$

3) If $A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$ $B = \begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$ and $(A+B)^2 = A^2+B^2$, then the values of a and b are

   a) a=4, b=1   b) a=1, b=4   c) a=0, b=4   d) a=2, b=4

4) If A is square matrix, then which of the following is not symmetric?

   a) $A+A^T$ b) AA^T c) A^TA d) $A-A^T$

5) The value of $\vec{AB}+\vec{BC} + \vec{DA} + \vec{CD}$ is

   a) $\vec{AD}$ b) $\vec{CA}$ c) $\vec{0}$ d) $-\vec{AD}$

6) If $\lambda\vec{i} + 2\lambda\vec{j} +2\lambda\vec{k}$ is a unit vector, then the value of λ is

   a) $\frac{1}{3}$ b) $\frac{1}{4}$ c) $\frac{1}{9}$ d) $\frac{1}{2}$

7) If $|\vec{a}| = 13$, $|\vec{b}| =5$ and $\vec{a} \cdot \vec{b} =60$ then $|\vec{a} \times \vec{b}|$ is

   a) 15   b) 35   c) 45   d) 25

8) If a vector makes equal angle with the coordinate axes then that angle is equal to

   a) $\cos^{-1}\left(\frac{1}{3}\right)$ b) $\cos^{-1}\left(\frac{2}{3}\right)$ c) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ d) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

9) $\lim\limits_{x \to 0} \frac{\sin x}{x} =$

   a) 0   b) -1   c) 1   d) ∞

10) $\lim\limits_{x \to 0} \frac{a^x - b^x}{x} =$

   a) log ab   b) $\log\left(\frac{a}{b}\right)$ c) $\log\left(\frac{b}{a}\right)$ d) $\frac{a}{b}$

II. Answer any 4 questions:-   4×2=8

11) If $A = \begin{pmatrix} 3 & 4 & 1 \\ 0 & -1 & 2 \\ 5 & -2 & 6 \end{pmatrix}$ then find the value of |A| using Sarrus method.

12) If $A = \begin{bmatrix} 0 & \sin\alpha & \cos\alpha \\ \sin\alpha & 0 & \sin\beta \\ \cos\alpha & -\sin\beta & 0 \end{bmatrix}$ then find |A|

13) If (-2, -3), (3,2), (-1, -8) are all vertices of a triangle then find the area using Determinant Method.

14) Find the unit vector in the direction of $5\vec{i} - 3\vec{j} + 4\vec{k}$.

15) If $\vec{a} = 2\vec{i} + \lambda\vec{j} + \vec{k}$ and $\vec{b} = \vec{i} - 2\vec{j} + 3\vec{k}$ are perpendicular vectors then find the value of λ?

16) Evaluate $\lim\limits_{x \to 0} \left[\dfrac{x^2 + x}{x} + 4x^3 + 3 \right]$

17) Evaluate: $\lim\limits_{x \to 0} \dfrac{x^4 - 16}{x - 2}$

III. Answer any 4 questions:-   4×3=12

18) Show that: $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

19) Show that: $\begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ca - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2$

20) If the point P divides the line segment AB internally in the ratio m:n then find the position vector of 'P'

21) Find the magnitude direction ratios and direction cosines of the vector $3\vec{i} - 4\vec{j} + 8\vec{k}$

22) Show that the points whose position vectors are $2\vec{i} + 3\vec{j} - 5\vec{k}$, $3\vec{i} + \vec{j} - 2\vec{k}$ and $6\vec{i} - 5\vec{j} + 7\vec{k}$ are collinear.

23) Evaluate: $\lim\limits_{x \to \infty} \dfrac{2x^2 - 2x + 3}{x^2 + 4x + 4}$

24) Evaluate: $\lim\limits_{x \to \infty} \dfrac{\sin \alpha x}{\sin \beta x}$

IV. Answer all the questions:-   3×5=15

25) Express the matrix $A = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a Symmetric and a skew-symmetric matrices.

[or]

Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left(1 + \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c}\right)$ without expanding the determinant.

26) Using factor theorem prove that $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$ **[or]**

Show that the points with position vectors $2\vec{i} + 4\vec{j} + 3\vec{k}$, $4\vec{i} + \vec{j} + 9\vec{k}$ and $10\vec{i} - \vec{j} + 6\vec{k}$ form a right-angle triangle.

27) Prove that the medians of a triangle are concurrent.   **[or]**

Prove that $\lim\limits_{\theta \to 0} \dfrac{\sin \theta}{\theta} = 1$

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