



V11M

Common Second Mid Term Test - 2023

Standard 11 MATHEMATICS

Marks: 50

Time: 1.30 Hrs.

Part - A

10×1=10

Answer all the questions:

- 1) If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if $xy = 1$, then $\det(AA^T)$ is equal to
 - a) $(a-1)^2$
 - b) $(a^2+1)^2$
 - c) a^2-1
 - d) $(a^2-1)^2$
- 2) 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
- 3) If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ then its cofactor matrix $\begin{vmatrix} A_1 & B_1 & C_1 \\ A_2 & B_2 & C_2 \\ A_3 & B_3 & C_3 \end{vmatrix} =$
 - a) Δ
 - b) 0
 - c) 1
 - d) Δ^2
- 4) If $\begin{bmatrix} -2 & 3 \\ -2 & 0 \end{bmatrix}$ is singular then $a = ?$
 - a) 2
 - b) 3
 - c) -3
 - d) -2
- 5) ABCD is a parallelogram, then $\overline{AB} + \overline{AD} + \overline{CB} + \overline{CD} =$
 - a) $2(\overline{AB} + \overline{AD})$
 - b) $4\overline{AC} \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$
 - c) $4\overline{BD}$
 - d) $\vec{0}$
- 6) If $\vec{a} + 2\vec{b}$ and $3\vec{a} + m\vec{b}$ are parallel then the value of m is
 - a) 3
 - b) $\frac{1}{3}$
 - c) 6
 - d) $\frac{1}{6}$
- 7) If α, β, γ are the direction angles of a position vector then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$
 - a) 0
 - b) 1
 - c) 2
 - d) 3
- 8) $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a} \cdot \vec{b} = 60^\circ$ then $|\vec{a} \times \vec{b}|$ is
 - a) 15
 - b) 35
 - c) 45
 - d) 25
- 9) $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 - 1}}{2x + 1} =$
 - a) 1
 - b) 0
 - c) -1
 - d) $\frac{1}{2}$
- 10) $\lim_{\theta \rightarrow 0} \frac{\sin \sqrt{\theta}}{\sqrt{\sin \theta}} =$
 - a) 1
 - b) -1
 - c) 0
 - d) 2

Part - B

4×2=8

Answer any four questions only:

11) If $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$, find $x+y$.

12) Evaluate: $\begin{vmatrix} x+y & y+z & z+x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$

Kindly send me your answer keys to us - padasalai.net@gmail.com

- 13) Find λ if the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are parallel.
- 14) Find the area of the parallelogram whose adjacent sides are $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$.
- 15) Show that $\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = \vec{0}$.
- 16) Find the positive integer n so that $\lim_{x \rightarrow 0} \frac{x^n - 3^n}{x - 3} = 27$.

Part - C

Answer any four questions only:

4x3=12

- 17) Express the matrix $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrices.

18) Prove that $\begin{vmatrix} 1 & x & x^2 \\ x & 1 & x \\ x & x & 1 \end{vmatrix} = \begin{vmatrix} 1 - 2x^2 & -x^2 & -x^2 \\ -x^2 & -1 & x^2 - 2x \\ -x^2 & x^2 - 2x & -1 \end{vmatrix}$.

- 19) If the area of the triangle with vertices $(-3, 0)$, $(3, 0)$ and $(0, k)$ is 9 square units, find the value of k .
- 20) If D and E are the midpoints of the sides AB and AC of a triangle ABC , prove that $\vec{BE} + \vec{DC} = \frac{3}{2}\vec{BC}$.
- 21) Show that the points whose position vectors are $2\hat{i} + 3\hat{j} - 5\hat{k}$, $3\hat{i} + \hat{j} - 2\hat{k}$ and $6\hat{i} - 5\hat{j} + 7\hat{k}$ are collinear.
- 22) Prove that $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$.

Part - D

Answer any four questions only:

4x5=20

23) Show that $\begin{vmatrix} a^2 + x^2 & ab & ac \\ ab & b^2 + x^2 & bc \\ ac & bc & c^2 + x^2 \end{vmatrix}$ is divisible by x^4 .

24) Prove that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$.

- 25) Prove that the medians of a triangle are concurrent.
- 26) If $ABCD$ is a quadrilateral and E and F are the mid points of AC and BD respectively. Prove that $\vec{AB} + \vec{AD} + \vec{CB} + \vec{CD} = 4\vec{EF}$.
- 27) Show that the points whose position vectors $4\hat{i} + 5\hat{j} + \hat{k}$, $-\hat{j} - \hat{k}$, $3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$ are coplanar.

28) Prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$.