TVL11M

Tirunelveli District

Common Second Mid Term Test - 2024

-11752-

Standard 11

MATHEMATICS

Time: 1.30 Hrs. Marks: 45

Part - A

Choose the correct answer: **10×1=10**

1) Which one of the following is not true about the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix}$?

a) a scalar matrix b) a diagonal matrix
c) an upper triangular matrix d) a lower triangular matrix

2) If $\Delta = \begin{vmatrix} a & b & c \\ x & y & z \\ p & q & r \end{vmatrix}$, then $\begin{vmatrix} Ka & Kb & Kc \\ Kx & Ky & Kz \\ Kp & Kq & Kr \end{vmatrix}$ is

a) Δ b) $K\Delta$ c) $3K\Delta$ d) $K^3\Delta$

3) The value of the determinant of $A = \begin{bmatrix} 0 & a & -b \\ -a & 0 & c \\ b & -c & 0 \end{bmatrix}$ is

a) $-2abc$ b) abc c) 0 d) $a^2+b^2+c^2$

4) The value of $\overrightarrow{AB}+\overrightarrow{BC}+\overrightarrow{CD}+\overrightarrow{DA}$ is

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

5) If $\vec{a}, \vec{b}, \vec{c}$ are position vectors of three collinear points, then which of the following is true?

a) $\vec{a}=\vec{b}+\vec{c}$ b) $2\vec{a}=\vec{b}+\vec{c}$ c) $\vec{b}=\vec{c}+\vec{a}$ d) $\overrightarrow{4a}+\vec{b}+\vec{c}=\vec{0}$

6) If $|\vec{a}|=13$, $|\vec{b}|=5$ and $\vec{a}.\vec{b}=60^o$, then $|\vec{a}\times\vec{b}|$ is

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

7) $\lim\limits_{x\to\pi/2} \dfrac{2x-\pi}{\cos x}$

a) 2 b) 1 c) −2 d) 0

8) $\lim\limits_{x\to 0} \dfrac{e^{\sin x}-1}{x} =$

a) 1 b) e c) $1/e$ d) 0

9) If $y = f(x^2+2)$ and $f'(3) = 5$, then $\dfrac{dy}{dx}$ at $x=1$ is

a) 5 b) 25 c) 15 d) 10

10) The derivative of $f(x) = x|x|$, at $x = -3$ is

a) 6 b) −6 c) doesnot exist d) 0

Part - B

Answer any FOUR questions. Question No. 16 is compulsory: **4×2=8**

11) If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, show that A^2 is a unit matrix.

12) Find the area of the triangle whose vertices are (−2, −3), (3, 2) and (−1, −8).

13) If D is the midpoint of the side of BC of a triangle ABC, prove that $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AD}$.

14) Calculate: $\lim_{t\to 1} \frac{\sqrt{t}-1}{t-1}$

15) Differentiate: $y = e^x \sin x$

16) Find the magnitude of $\vec{a}\times\vec{b}$ if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$.

Part - C

Answer any FOUR questions. Question No. 22 is compulsory: **4×3=12**

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

18) Show that the vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 6\hat{k}$, $\vec{b} = 6\hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{c} = 3\hat{i} - 6\hat{j} + 2\hat{k}$ are mutually orthogonal.

19) Show that $\lim_{n\to\infty} \frac{1+2+3+\ldots\ldots+n}{3n^2+7n+2} = \frac{1}{6}$.

20) Find $\frac{dy}{dx}$ if $x = a\cos^3 t$, $y = a\sin^3 t$.

21) Differentiate: $y = \frac{x^{3/4}\sqrt{x^2+1}}{(3x+2)^5}$

22) Using factor theorem, show that $\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc$.

Part - D

Answer ALL the questions: **3×5=15**

23) Verify that det(AB) = (det A) (det B) for $A = \begin{bmatrix} 4 & 3 & -2 \\ 1 & 0 & 7 \\ 2 & 3 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 3 \\ -2 & 4 & 0 \\ 9 & 7 & 5 \end{bmatrix}$.

(OR)

If $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$, show that $(1-x^2)y_2 - 3xy_1 - y = 0$.

24) Find the cosine and sine angle between the vectors $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 4\hat{i} - 2\hat{j} + 2\hat{k}$.

(OR)

Evaluate: $\lim_{x\to 0} \frac{\sqrt{x^2+a^2}-a}{\sqrt{x^2+b^2}-b}$

25) Differentiate: $y = \sin^2[\cos Kx]$

(OR)

Let A, B and C be the vertices of a triangle. Let D, E and F be the mid points of the sides BC, CA and AB respectively, show that $\overrightarrow{AD} + \overrightarrow{BE} + \overrightarrow{CF} = \vec{0}$.
