Tsi11M

Tenkasi District Common Examination
Common Second Mid Term Test - November 2022

Standard - 11
MATHEMATICS

Time Allowed:1.30 Hours | Maximum Marks: 45

PART - A

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

1. If A is a square matrix, then which of the following is not symmetric?
   a) $A + A^T$ b) AA^T c) A^TA d) $A - A^T$

2. If $A=\begin{bmatrix}1 & a\\ 0 & 1\end{bmatrix}$, then $A^3 =$
   a) $\begin{bmatrix}1 & a^3\\ 0 & 1\end{bmatrix}$ b) $\begin{bmatrix}1 & 3^a\\ 1 & 0\end{bmatrix}$ c) $\begin{bmatrix}1 & 3^a\\ 0 & 1\end{bmatrix}$ d) $\begin{bmatrix}1 & 0\\ a^3 & 1\end{bmatrix}$

3. If $A + I = \begin{bmatrix}3 & -2\\ 4 & 1\end{bmatrix}$, then (A+I) (A-I) is equal to
   a) $\begin{bmatrix}-5 & -4\\ 2 & -9\end{bmatrix}$ b) $\begin{bmatrix}-5 & 4\\ -8 & 9\end{bmatrix}$ c) $\begin{bmatrix}5 & 4\\ 8 & 9\end{bmatrix}$ d) $\begin{bmatrix}-5 & -4\\ -8 & -9\end{bmatrix}$

4. If $\overline{BA} = 3\hat{i}+2\hat{j}+\hat{k}$ and the position vector of B is $\hat{i}+3\hat{j}-\hat{k}$ then the position vector A is
   a) $4\hat{i}+2\hat{j}+\hat{k}$ b) $4\hat{i}+5\hat{j}$ c) $4\hat{i}$ d) $-4\hat{i}$

5. If $\vec{a}$ and $\vec{b}$ are two vectors of magnitude 2 and inclined at an angle 60°, then the angle between $\vec{a}$ and $\vec{a}+\vec{b}$ is
   a) 30° b) 60° c) 45° d) 90°

6. $\vec{a}=3\hat{i}+4\hat{j}$ and $\vec{b}=\hat{i}+\hat{j}+\hat{k}$, then the value of $|\vec{a}\times\vec{b}|$ =
   a) $\sqrt{14}$ b) 5 c) 0 d) $\sqrt{26}$

7. If (1,2,4) and (2,3d,-3) are the initial and terminal points of the vector $\hat{i}+5\hat{j}-7\hat{k}$, then the value of d is equal to
   a) $\frac{7}{3}$ b) $\frac{-7}{3}$ c) $\frac{-5}{3}$ d) $\frac{5}{3}$

8. $\lim_{\theta\to 0}\frac{\sin\sqrt{\theta}}{\sqrt{\sin\theta}}$ =
   a) 1 b) -1 c) 0 d) 2

9. $\lim_{x\to 0}\frac{\left(e^{\sin x}-1\right)}{x}$.
   a) 1 b) e c) $\frac{1}{e}$ d) 0

10. $\lim_{x\to 0}\frac{a^x-b^x}{x}$
    a) log ab b) $\log\left(\frac{a}{b}\right)$ c) $\log\left(\frac{b}{a}\right)$ d) $\frac{a}{b}$

PART - B

II. Answer 4 questions. Qn.No. 16 is compulsory: **4×2=8**

11. For what value of x, the matrix $A = \begin{bmatrix}0 & 0 & -2\\ -1 & 0 & x^3\\ 2 & -3 & 0\end{bmatrix}$ is skew - symmetric.

12. Determine the value of 'b' so that following matix is singular: $B = \begin{bmatrix} b-1 & 2 & 3 \\ 3 & 1 & 2 \\ 1 & -2 & 4 \end{bmatrix}$

13. If $\vec{a}=2\hat{i}+3\hat{j}-4\hat{k}$, $\vec{b}=3\hat{i}-4\hat{j}-5\hat{k}$ and $\vec{c}=-3\hat{i}+2\hat{j}+3\hat{k}$, find the magnitude of $\vec{a}+\vec{b}+\vec{c}$.

14. Evaluate : $\lim_{x\to 1}\frac{x^m-1}{x^n-1}$, m,n are integers.

15. Do the limits of following function exist as x→0? State the reason for your answer: $\frac{\sin x}{|x|}$

16. Find the angle between the vectors $5\hat{i}+3\hat{j}+4\hat{k}$ and $6\hat{i}+8\hat{j}+\hat{k}$.

PART - C

IiI. Answer 4 questions. Qn.No. 22 is compulsory: **4×3=12**

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

18. 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

19. 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.

20. For any vector, $\vec{a}$ prove that $|\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times\hat{k}|^2=2|\vec{a}|^2$.

21. Evaluate : $\lim_{x\to 0}\frac{1-\cos x}{x^2}$.

22. Prove that $\lim_{x\to a}\frac{x^n-a^n}{x-a} = na^{n-1}$.

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PART - D

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

23. a) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and $A^3 - 6A^2 + 7A + KI = 0$, Find the values of 'K'.

(OR)

b) Show that $\begin{bmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{bmatrix}$ = (a+b+c) (a-b) (b-c) (c-a)

24. a) Prove that the medians of a triangle are concurrent

(OR)

b) Show that the following vectors $\hat{i}-2\hat{j}+3\hat{k}$, $-2\hat{i}+3\hat{j}-4\hat{k}$ and $-\hat{j}+2\hat{k}$ are coplanar.

25. a) Prove that $\lim_{x\to 0}\frac{a^x-1}{x} = \log a$, a > 0.

(OR)

b) Show that, the function $\begin{cases} \frac{x^3-1}{x-1}, & \text{if } x \neq 1 \\ 3, & \text{if } x = 1 \end{cases}$ is continuous on $(-\infty,\infty)$
