MODEL SECOND MID-TERM EXAMINATION-3 - 2024

XI – STD – MATHEMATICS

Time: 1.30 Hrs **Maximum Marks: 45**

PART – I (Marks: 10)

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

1. The value of x, for which the matrix $A = \begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular **(7-11)**

(1)9 (2) 8 (3) 7 (4) 6

2. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of $\lambda, A^2 = 0$? **(7-25)**

(2) ± 1 (3) -1 (4) 1

3. Let A and B be two symmetric matrices of same order. Then which one of the following statement is not true? **(7-25)**

(1) $A + B$ *is a symmetric matrix*

(2) AB *is a symmetric matrix* (3) $AB = (BA)^T$ (4) $A^T B = A\,B^T$

4. If $ABCD$ is a parallelogram, then $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD}$ is equal to **(8-8)**

(1) $2\left(\overrightarrow{AB} + \overrightarrow{AD}\right)$ (2) $4\overrightarrow{AC}$ (3)$4\overrightarrow{BD}$ (4) $\vec{0}$

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 **(8-20)**

(1) 30° (2) 60° (3) 45° (4) 90°

6. If $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 2\hat{k}, |\vec{b}| = 5$ and the angle between $\vec{a}$ *and* $\vec{b}$ is $\frac{\pi}{6}$ then the area of the triangle formed by these two vectors as two sides is **(8-25)**

(1)$\frac{7}{4}$ (2) $\frac{15}{4}$ (3) $\frac{3}{4}$ (4) $\frac{17}{4}$

7. $\lim_{x\to\infty} \frac{\sin x}{x}$ **(9-1)** Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302

(1)1 (2) 0 (3) ∞ (4) $-\infty$

8. If $f(x) = x(-1)^{\left\lfloor \frac{1}{x} \right\rfloor}$, $x \leq 0$, then the value of $\lim_{x\to 0} f(x)$ is equal to **(9-9)**

(1)-1 (2) 0 (3)2 (4) 4

9. $\lim_{x\to 0} \frac{e^{\tan x}-e^{x}}{\tan x-} =$ **(9-18)**

(1) 1 (2) e (3) $\frac{1}{2}$ (4) 0

10. $\lim_{\alpha\to\frac{\pi}{4}} \frac{\sin\alpha-\cos\alpha}{\alpha-\frac{\pi}{4}}$ is **(9-15)**

(1)$\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$ (3)1 (4) 2

PART – II (Marks: 8)

II. Answer any 4 Questions. Question No. 16 is compulsory. 4×2=8

11. Consider the matrix $A_\alpha = \begin{bmatrix}\cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha\end{bmatrix}$ $(i) show\ that\ A_\alpha A_\beta = A_{(\alpha+\beta)}$

(ii) find all possible real values of α satisfying the condition $A_\alpha + A_\alpha^T = I$ $(\boldsymbol{Ex.7.1-6})$

12. Solve for $x\ if\ [x \quad 2 \quad -1]\begin{bmatrix}1 & 1 & 2\\ -1 & -4 & 1\\ -1 & -1 & -2\end{bmatrix}\begin{bmatrix}x\\2\\1\end{bmatrix} = [0]$ $(\boldsymbol{Eg.7.9})$

13. find $(\vec{a}+3\vec{b}).(2\vec{a}-\vec{b})\ if\ \vec{a}=\hat{\imath}+\hat{\jmath}+2\hat{k}\ and\ \vec{b}=3\hat{\imath}+2\hat{\jmath}-\hat{k}$

$(\boldsymbol{Eg.8.12})$ Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302

14. If $|\vec{a}|=5,\ |\vec{b}|=6, |\vec{c}|=7$ and $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ find $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$

$(\boldsymbol{Ex.8.3-8})$

15. State and prove Sandwich Theorem **(Pg. 109)**

16. Find $\lim_{t\to 0} \frac{\sqrt{t^2+9}-3}{t^2}$ $(\boldsymbol{Eg.9.15})$

PART – III (Marks: 12)

III. Answer any 4 Questions. Question No. 22 is compulsory. 4×3=12

17. Prove that $\begin{vmatrix}1 & x & x\\ x & 1 & x\\ x & x & 1\end{vmatrix}^2 = \begin{vmatrix}1-2x^2 & -x^2 & -x^2\\ -x^2 & -1 & x^2-2x\\ -x^2 & x^2-2x & -1\end{vmatrix}$ $(\boldsymbol{Eg.7.30})$

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 $(\boldsymbol{Ex.7.2-11})$

19. If D and E are the midpoints of the sides AB and AC of a triangle ABC, prove that $\overrightarrow{BE} + \overrightarrow{DC} = \frac{3}{2}\overrightarrow{BC}$. $(\boldsymbol{Ex.8.1-4})$

20. For any two vectors $\vec{a}$ *and* $\vec{b}$ prove that $|\vec{a} \times \vec{b}|^2 + (\vec{a}.\vec{b})^2 = |\vec{a}|^2 |\vec{b}|^2$ $(\boldsymbol{Eg.8.25})$ **Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302**

21. Evaluate: $\lim_{x\to\infty} x\left(3^{\frac{1}{x}} + 1 - cos\left(\frac{1}{x}\right) - e^{\frac{1}{x}}\right)$ $(\boldsymbol{Ex.9.4-18})$

22. Evaluate: $\lim_{x\to 0} \frac{\tan}{\sin 5x}$ $(\boldsymbol{Ex.9.4-8})$

PART – IV (Marks: 15)

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

23. Find the value of the product $\begin{vmatrix} \log_3 64 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix} \times \begin{vmatrix} \log_2 3 & \log_8 3 \\ \log_3 4 & \log_3 4 \end{vmatrix}$ **(Ex. 7.4-6)**

(OR) 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 value of k.**(Ex. 7.1-9)**

24. If ABCD is a quadrilateral and E and F are the midpoints of AC and BD respectively, then prove that $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD} = 4\overrightarrow{EF}$. $(\boldsymbol{Ex.8.1-12})$

(OR) Show that the following vectors are coplanar $(\boldsymbol{Ex.8.2-9})$

(i) $2\hat{\imath} + 3\hat{\jmath} + \hat{k},\ \hat{\imath} - \hat{\jmath},\ 7\hat{\imath} + 3\hat{\jmath} + 2\hat{k}$

25. *Evaluate*: $\lim_{x\to 1} \frac{\sqrt[3]{7+x^3} - \sqrt{3+x^2}}{x-1}$ **(Ex. 9.2- 10)**

(OR) A function f is defined as follows:

$$f(x) = \begin{cases} 0, & for\ x < 0 \\ x, & for\ 0 \le x < 1 \\ -x^2 + 4x - 2, & for\ 1 \le x < 3 \\ 4 - x, & for\ x \ge 3 \end{cases}$$ *is the* function continuous?

(Ex.9.5-10)

Mr. K. MURUGANANDHAM. MSc. MEd. MPhil.

P.G – ASST IN MATHS

SEARCH IN YOU TUBE MURUGANANDHAM MATHS

LINK : https://youtube.com/user/TheMuruganandham