MODEL SECOND MID-TERM EXAMINATION-1 - 2024

XI – STD – MATHEMATICS

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

PART – I (Marks: 10)

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

1. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of $\lambda, A^2 = 0$? **(7-5)**

(1) 0 (2) ± 1 (3) -1 (4) 1

2. If $A = \begin{vmatrix} -1 & 2 & 4 \\ 3 & 1 & 0 \\ -2 & 4 & 2 \end{vmatrix}$ *and* $B = \begin{vmatrix} -2 & 4 & 2 \\ 6 & 2 & 0 \\ -2 & 4 & 8 \end{vmatrix}$, then B is given by **(7-21)**

(1) $B = 4A$ (2) $B = -4A$ (3) $B = -A$ (4) B=6A

3. Which one of the following is not true about the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix}$? **(7-3)**

(1)a scalar matrix (2) a diagonal matrix
(3) an upper triangular matrix (4) a lower triangular matrix

4. If $\vec{a} + 2\vec{b}$ and $3\vec{a} + m\vec{b}$ are parallel, then the value of m is **(8-2)**

(1)3 (2) $\frac{1}{3}$ (3) 6 (4) $\frac{1}{6}$

5. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of three collinear points, then which of the following is true? **(8-11)** **Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302**

(1) $\vec{a} = \vec{b} + \vec{c}$ (2) $2\vec{a} = \vec{b} + \vec{c}$ (3) $\vec{b} = \vec{c} + \vec{a}$ (4) $4\vec{a} + \vec{b} + \vec{c} = 0$

6. If $|\vec{a}| = 13, |\vec{b}| = 5$ and $\vec{a}.\vec{b} = 60°$ the $|\vec{a} \times \vec{b}|$ is **(8-18)**

(1) 15 (2) 35 (3) 45 (4) 25

7. $\lim_{x \to 0} \frac{\sqrt{1-\cos 2x}}{x}$ **(9-3)**

(1)0 (2) 1 (3) $\sqrt{2}$ (4) does not exist

8. $\lim_{x \to 0} \frac{x\, e^x - \sin x}{x}$ is **(9-13)**

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

9. The function $f(x) = \begin{cases} \frac{x^2-1}{x^3+1}, & x \neq -1 \\ p & x = -1 \end{cases}$ is not defined for $x = -1$.

the value of $f(-1)$so that the function extended by this value is continuous is **(9-23)**

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

10. If $\vec{a} = \hat{\imath} + \hat{\jmath} + \hat{k}$, $\vec{b} = 2\hat{\imath} + x\hat{\jmath} + \hat{k}$, $\vec{c} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}$ and $\vec{a} \cdot (\vec{b} \times \vec{c}) = 70$ then x is equal to **(8-24)**

(1) 5 (2) 7 (3) 26 (4) 10

PART – II (Marks: 8)

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

11. Prove that $\begin{vmatrix} sec^2\theta & tan^2\theta & 1 \\ tan^2\theta & sec^2\theta & -1 \\ 38 & 36 & 2 \end{vmatrix} = 0$ $(\boldsymbol{Ex.7.2-5})$

12. Compute |A| using Sarrus Rule if $A = \begin{bmatrix} 3 & 4 & 1 \\ 0 & -1 & 2 \\ 5 & -2 & 6 \end{bmatrix}$ $(\boldsymbol{Eg.7.17})$

13. Find λ when the projection of $\vec{a} = \lambda\hat{\imath} + \hat{\jmath} + 4\hat{k}$ on $\vec{b} = 2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$ *is* 4 *units*. $(\boldsymbol{Ex.8.3-13})$

14. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$ prove that and $\vec{a}$ *and* $\vec{b}$ are perpendicular. $(\boldsymbol{Eg.8.14})$

15. Evaluate: $\lim_{x\to 0} \frac{2^x - 3^x}{x}$ $(\boldsymbol{Ex.9.4-15})$

16. Evaluate: $\lim_{x\to 0} (1 + \sin x)^{2cose\ x}$ $(\boldsymbol{Eg.9.32})$

PART – III (Marks: 12)

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

11. If $A = \begin{bmatrix} 4 & 2 \\ -1 & x \end{bmatrix}$ and such that $(A - 2I)(A - 3I) = 0$ Find the value of x. $(\boldsymbol{Ex.7.1-7})$ **Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302**

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

18. find the projection of the vector $\hat{\imath} + 3\hat{\jmath} + 7\hat{k}$ on the vector $2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$. $(\boldsymbol{Ex.8.3-12})$

19. Let $\vec{a}$ *and* $\vec{b}$ be the position vectors of the points A and B. prove that the position vectors of the points which trisects the line segment AB are $\frac{\vec{a}+2\vec{b}}{3}$ and $\frac{\vec{b}+2\vec{a}}{3}$

$(\boldsymbol{Ex.8.1-3})$

20. Alcohol is removed from the body by the lungs, the kidneys, and by chemical processes in liver. At moderate concentration levels, the majority work of

removing the alcohol is done by the liver; less than 5% of the alcohol is eliminated by the lungs and kidneys. the rate r at which the liver processes alcohol from the bloodstream is related to the blood alcohol concentration x by a rational function of the form $r(x) = \frac{\alpha x}{x+\beta}$ for some positive constants α and β. Find the maximum possible rate of removal. $(\boldsymbol{Eg.9.25})$

21. Evaluate: $\lim_{x\to 0} \frac{\sqrt{x^2+1}-1}{\sqrt{x^2+16}-4}$ $(\boldsymbol{Ex.9.2-8})$

PART – IV (Marks: 15)

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

22. Prove that $\begin{bmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{bmatrix} = 4a^2b^2c^2$ $(\boldsymbol{Ex.7.2-3})$

(OR) If a, b, c are all positive, and are p^{th}, q^{th} and r^{th} terms of G.P, show that $\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} = 0.$ $(\boldsymbol{Ex.7.2-12})$

12. Show that the vectors $5\hat{\imath}+6\hat{\jmath}+7\hat{k}$, $7\hat{\imath}-8\hat{\jmath}+9\hat{k}$ and $3\hat{\imath}+20\hat{\jmath}+5\hat{k}$ are coplanar. $(\boldsymbol{Eg.8.10})$ **Mr. K.MURUGANANDHAM. M.Sc., M.Ed, M.Phil +91-98431 51302**

(OR) If $\vec{a}, \vec{b}$ are unit vectors and θ is the angle between them, show that **(Ex. 8.3-10).** $(i)\ \sin\frac{\theta}{2} = \frac{1}{2}\left|\vec{a}-\vec{b}\right|$ $(ii)\ \cos\frac{\theta}{2} = \frac{1}{2}\left|\vec{a}+\vec{b}\right|$ $(iii)\ \tan\frac{\theta}{2} = \frac{|\vec{a}-\vec{b}|}{|\vec{a}+\vec{b}|}$

23. *show that* $\lim_{x\to 0^+} x\left[\left[\frac{1}{x}\right]+\left[\frac{2}{x}\right]+\cdots.+\left[\frac{15}{x}\right]\right] = 120$ $(\boldsymbol{Eg.9.31})$.

(OR) Find the points of discontinuity of the function f, where $(\boldsymbol{Ex.9.5-3})$

$(i)\ f(x) = \begin{cases} 4x+5, & if\ x \le 3 \\ 4x-5, & if\ x > 3 \end{cases}$

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P.G – ASST IN MATHS

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