Perambalur District

11 - STD SECOND MID TERM EXAMINATION - 2024

TIME : 1.30 Hrs **MATHS** **MARKS : 45**

PART – A

i. Answer all the questions
ii. Choose the most suitable answer from the given four alternatives. *10X 1 = 10*

1. 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
2. If the points $(x,-2),(5,2),(8,8)$ are collinear, then x is equal to
   a) -3 b) $\frac{1}{3}$ c) 1 d) 3
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. If $A=\begin{bmatrix}2 & a\\ a & 8\end{bmatrix}$ is a singular matrix, then the value of a is
   a) 2 b) 4 c) -4 d) ±4
5. The value of $\overrightarrow{AB}+\overrightarrow{BC}+\overrightarrow{DA}+\overrightarrow{CD}$ is
   a) $\vec{AD}$ b) $\vec{CA}$ c) $\vec{O}$ d) $-\vec{AD}$
6. If $\bar{a}$ and $\bar{b}$ are two vectors of magnitude 2 and inclined at an angle 60°, then the angle between $\bar{a}$ and $\vec{a}+\vec{b}$ is
   a) 30° b) 60° c) 45° d) 90°
7. If $2\hat{i}-3\hat{j}+\hat{k}$ and $4\hat{i}+k\hat{j}+2\hat{k}$ are parallel vectors, then the value of k is
   a) 3 b) -3 c) -6 d) 6
8. $\lim\limits_{x\to\infty}\frac{a^x-b^x}{x}=$
   a) $\log ab$ b) $\log\left(\frac{a}{b}\right)$ c) $\log\left(\frac{b}{a}\right)$ d) $\frac{a}{b}$
9. $\lim\limits_{x\to\infty}\frac{\sin x}{x}=$
   a) 1 b) 0 c) ∞ d) $-\infty$
10. The value of $\lim\limits_{x\to0}\frac{\sin x}{\sqrt{x^2}}$ is
    a) 1 b) -1 c) 0 d) ∞

PART – B

i. Answer any four questions:–
ii. Question No. 16 is compulsory:–. *4X 2= 8*

11. If $A=\begin{bmatrix}1 & a\\ 0 & 1\end{bmatrix}$, then compute A^4.
12. If $(k,2),(2,4)$ and $(3,2)$ are vertices of the triangle of area 4 square units then determine the value of k.

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13. For any vectors $\vec{r}$, prove that $\vec{r} = (\vec{r}\cdot\hat{i})\hat{i} + (\vec{r}\cdot\hat{j})\hat{j} + (\vec{r}\cdot\hat{k})\hat{k}$.

14. If $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ are perpendicular vector, then find the value of λ.

15. Compute $\lim\limits_{x\to 1} \dfrac{x^3 - 1}{x - 1}$

16. If $A^T = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$, then find A^2.

PART – C

i. Answer any four questions:–
ii. Question No. 22 is compulsory:–

4X 3= 12

17. Express the matrix $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrices.

18. If A and B be two symmetric matrices, then prove that $AB + BA$ is a symmetric matrix.

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. Find the angle between the vectors $2\hat{i} + \hat{j} - \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$ using vector product.

21. Evaluate $\lim\limits_{x\to 0} \dfrac{\sin \alpha x}{\sin \beta x}$

22. For any two vectors $\vec{a}$ and $\vec{b}$, prove that $|\vec{a}\times\vec{b}|^2 + (\vec{a}\cdot\vec{b})^2 = |\vec{a}|^2|\vec{b}|^2$.

PART – D

i. Answer all the questions:–

3X 5= 15

23. (a) Prove that $\begin{vmatrix} a^2 & bc & ac + c^2 \\ a^2 + ab & b^2 & ac \\ ab & b^2 + bc & c^2 \end{vmatrix} = 4a^2b^2c^2$.

(or)

(b) Using Factor theorem, show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$.

24. (a) 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.

(or)

(b) The medians of a triangle are concurrent.

25. (a) Prove that $\lim\limits_{\theta\to 0} \dfrac{\sin\theta}{\theta} = 1$.

(or)

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