SECOND MIDTERM EXAM - 2022

CLASS : 11

MATHEMATICS

MARKS : 50

TIME : 1.30 HRS

I. Answer all the questions. 10 x 1 = 10

1. If the points $(x, -2)\ (5,2)(8,8)$ are collinear, then x is equal to (a) (-3) (b) 1/3 (c) 1 (d) 3

2. If $A=\begin{pmatrix}\lambda & 1\\ -1 & \lambda\end{pmatrix}$ then for which value of λ, $A^2=0$? (a) 0 (b) ± 1 (c) -1 (d) 1

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. A vector makes equal angle with the positive direction of the coordinate axes. Then each angle is equal to

(a) $Cos^{-1}\left(\frac{1}{3}\right)$ (b) $Cos^{-1}\left(\frac{2}{3}\right)$ (c) $Cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (d) $Cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

5. If $|\vec{a}|=13|\vec{b}|=5$ and $\vec{a}.\vec{b}=60^\circ$ then $|\vec{a}*\vec{b}|$ is (a) 15 (b) 35 (c) 45 (d) 25

6. If $\lambda\hat{i}+2\lambda\hat{j}+2\lambda\hat{k}$ is a unit Vector, then the value of λ is (a) 1/3 (b) 1/4 (c) 1/9 (d) 1/2

7. $\lim\limits_{x\to\infty}\frac{a^x-b^x}{x}$ (a) log ab (b) log(a/b) (c) log (b/a) (d) a/b

8. $\lim\limits_{x\to\infty}\frac{\sin x}{x}$ (a) 1 (b) 0 (c) ∞ (d) $-\infty$

9. $\lim\limits_{x\to 0}\frac{1-Cos^2x}{xSin2x}$ (a) 1 (b) 1/2 (c) 0 (d) 2

10. The value of x, for which the matrix $A=\begin{bmatrix}4 & 3\\ -2 & x\end{bmatrix}$ is singular (a) 3/2 (b) -3/2 (c) 3 (d) -2

II. Answer any 5 questions. (Q.No.17 is compulsory) 5 x 2 = 10

11. Find the value of x if $\begin{bmatrix}x-1 & x & x-2\\ 0 & x-2 & x-3\\ 0 & 0 & x-3\end{bmatrix}=0$

12. Determine the value of $x+y$ if $\begin{bmatrix}2x+y & 4x\\ 5x-7 & 4x\end{bmatrix}=\begin{bmatrix}7 & 7y-13\\ y & x+6\end{bmatrix}$

13. Find the value of λ for which the vectors $\vec{a}$ and $\vec{b}$ are perpendicular, where $\vec{a}=2\hat{i}+\lambda\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-2\hat{j}+3\hat{k}$

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

15. Calculate $\lim_{x\to 3}\frac{x^2-6x+5}{x^3-8x+7}$

16. Find the positive integer n so that $\lim_{x\to 3}\frac{x^n-3^n}{x-3}=27$

17. Show that $\begin{bmatrix} x+2a & y+2b & z+2c \\ x & y & z \\ a & b & c \end{bmatrix}=0$

III. Answer any 5 questions. (Q.No.24 is compulsory) **5 x 3 = 15**

18. Without expanding, evaluate the following determinants $\begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 6x & 9x & 12x \end{bmatrix}$

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

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

21. If G is the centroid of a triangle ABC, prove that $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}=\vec{0}$

22. Fine $\lim_{t\to 0}\frac{\sqrt{t^2+9}-3}{t^2}$

23. Prove that $f(x)=2x^2+3x-5$ is continuous at all points in R

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

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

25. a. Show that $|A|=\begin{bmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{bmatrix}=8abc$ by using Factors Theorem. (OR)

b. Prove that the medians of a triangle are concurrent.

26. a. Prove that the points whose position Vectors $2\hat{i}-4\hat{j}-3\hat{k}, 4\hat{i}+\hat{j}+9\hat{k}, 10\hat{i}-\hat{j}+6\hat{k}$ form a right angled triangle. (OR)

b. Show that $\lim_{n\to\infty}\frac{1^2+2^2+.....+(3n)^2}{(1+2+....5n)(2n+3)}=\frac{9}{25}$

27. a. Find the value of the product $\begin{bmatrix} \log_3^{64} & \log_4^3 \\ \log_3^8 & \log_4^9 \end{bmatrix}*\begin{bmatrix} \log_2^3 & \log_8^3 \\ \log_3^4 & \log_3^4 \end{bmatrix}$ (OR)

b. Show that $\lim_{x\to 0} x\left[\left[\frac{1}{x}\right]+\left[\frac{2}{x}\right]+.....\left[\frac{15}{x}\right]\right]=120$