SECOND MID TERM EXAMINATION - 2023

Class : 11 MATHEMATICS

Reg.No 11BE43

Time 1.30 Hours MARK : 50

PART - I

Answer all the questions. 10 X 1 = 10

1. Which one of the following is not true about the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix}$?

a) a scalar Matrix b) a diagonal matrix c) an upper triangular d) a lower triangular matrix

2. A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is

a) 6 b) 3 c) 0 d) -6

3. If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if xy=1 then det (AA^T)- is equal to

a) $(a-1)^2$ b) $(a^2+1)^2$ c) a^2-1 d) $(a^2-1)^2$

4. 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) $A-A^T$

5. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$, A^2 is the Identity, then x=?

a) 3 b) 1 c) 0 d) 2

6. The unit Vector parallel to the resultant of the vectors $\hat{i}+\hat{j}-\hat{k}$ and $\hat{i}-2\hat{j}+\hat{k}$ is

a) $\frac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ b) $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$ c) $\frac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ d) $\frac{2\hat{i}-\hat{j}}{\sqrt{5}}$

7. If $\vec{a}, \vec{b}$ are the position vectors A and B, Then which one of the following points whose position vector lies on AB, is

a) $\vec{a}+\vec{b}$ b) $\frac{2\vec{a}-\vec{b}}{2}$ c) $\frac{2\vec{a}+\vec{b}}{3}$ d) $\frac{\vec{a}-\vec{b}}{3}$

8. If the projection of $5\hat{i}-\hat{j}-3\hat{k}$ on the Vector $\hat{i}+3\hat{j}+\lambda\hat{k}$ - is same as the projection of $\hat{i}+3\hat{j}+\lambda\hat{k}$ on $5\hat{i}-\hat{j}-3\hat{k}$ then λ is equal to

a) ± 4 b) ± 3 c) ± 5 d) ± 1

9. A Vector makes equal angle with the postive direction of the coordinate areas. Then each angle is equal to

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

10. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then the value of $(\vec{r} \times \hat{i}).(\vec{r} \times \hat{j}) + xy$ is equal to

a) 0 b) 1 c) 2 d) 3

PART - II

II) Answer any 4 questions. Q.No.16 is compulsory. **4 X 2 = 8**

11. If $\begin{bmatrix} 0 & P & 3 \\ 2 & q^2 & -1 \\ r & 1 & 0 \end{bmatrix}$ is Skew - symmetric, fine the Values of p, q, and r .

12. Prove that $\begin{bmatrix} \text{Sec}^2\theta & \tan^2\theta & 1 \\ \tan^2\theta & \text{Sec}^2\theta & -1 \\ 38 & 36 & 2 \end{bmatrix} = 0$

13. Identify the singular or Non-Singula Matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$.

14. If D is the midpoint of the side BC of a triangle ABC, prove that $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AD}$.

15. Find the value or values of m for which $m(\hat{i} + \hat{j} + \hat{k})$ is a unit Vector.

16. If A and B are symmetric matrices of same order, prove that AB+BA is a symmetric Matrix.

PART - III

III) Answer 4 questions. Q.No.22 is Compulsory. **4 X 3 = 12**

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

18. Show that $\begin{vmatrix} 0 & c & b \\ c & 0 & a \\ b & a & 0 \end{vmatrix}^2 = \begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix}$

19. Determine the root of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$.

20. Find the vectors of magnitude 6 which are penpendicular to both Vectors $\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$.

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

22. Let $\vec{a}, \vec{b}, \vec{c}$ be unit Vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c} = 0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{3}$ Prove that $\vec{a} = \pm\frac{2}{\sqrt{3}}(\vec{b} \times \vec{c})$.

PART - IV

IV) Answer all the Questions. **4 X 5 = 20**

23. a) Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$.

(OR)

b) Prove that $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$.

24. a) Show that $\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc$

(OR)

b) Prove that $\begin{vmatrix} 1 & x & x \\ x & 1 & x \\ x & x & 1 \end{vmatrix}^2 = \begin{vmatrix} 1-2x^2 & -x^2 & -x^2 \\ -x^2 & -1 & x^2-2x \\ -x^2 & x^2-2x & -1 \end{vmatrix}$

25. a) The medians of a triangle are concurrent.

(OR)

b) Prove that the points whose position vectors $2\hat{i}+4\hat{j}+3\hat{k}$, $4\hat{i}+\hat{j}+9\hat{k}$ and $10\hat{i}-\hat{j}+6\hat{k}$ from a right angled triangle.

26. a) Show that the points whose position vectors $4\hat{i}+5\hat{j}+\hat{k}$, $-j-k$, $3i+9j+4k$ and $-4\hat{i}+4\hat{j}+4\hat{k}$ are coplanar.

(OR)

b) Find the cosine and sine angle between the Vectors $\vec{a}=2\hat{i}+\hat{j}+3\hat{k}$ and $\vec{b}=4\hat{i}-2\hat{j}+2\hat{k}$