SECOND MID TERM TEST - 2024

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Standard XI Reg.No. [ ]

MATHEMATICS

Time : 1.30 hrs **Part - I** *Marks : 50*

I. Choose the correct answer: **8 x 1 = 8**

1. Choose the one that does not apply among the following.

   a) $\begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 & -7/2 \\ 7/2 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 3.2 \\ -3.2 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

2. If $\begin{bmatrix} 4 & 3 \\ -2 & x \end{bmatrix}$ is a zero matrix, then the value of x a) $3/2$ b) $-3/2$ c) 3 d) –2

3. If $A + I = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$, then $(A + I)(A - I)$ is equal to

   a) $\begin{bmatrix} -5 & -4 \\ 8 & -9 \end{bmatrix}$ b) $\begin{bmatrix} -5 & 4 \\ -8 & 9 \end{bmatrix}$ c) $\begin{bmatrix} 5 & 4 \\ 8 & 9 \end{bmatrix}$ d) $\begin{bmatrix} -5 & -4 \\ -8 & -9 \end{bmatrix}$

4. If α, β, γ then Direction cosines $\cos^2\alpha + \cos^2\beta + \cos^2\gamma$

   a) 1 b) 2 c) 0 d) –2

5. If the points whose position vectors $10\hat{i} + 3\hat{j}$, $12\hat{i} - 5\hat{j}$ and $a\hat{i} + 11\hat{j}$ are collinear, then a is equal to a) 6 b) 3 c) 5 d) 8

6. Find $|\vec{a} \times \vec{b}|$ where $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a}.\vec{b} = 60^o$ =

   a) 15 b) 35 c) 45 d) 25

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

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

8. $\lim_{x \to \infty} \frac{a^x - b^x}{x} =$ a) $\log ab$ b) $\log\left(\frac{a}{b}\right)$ c) $\log\left(\frac{b}{a}\right)$ d) $\frac{a}{b}$

Part - II

II. Answer any 6 questions. (Q.No.16 is compulsory) **6 x 2 = 12**

9. If $A = \begin{bmatrix} 4 & 2 \\ -1 & x \end{bmatrix}$ and such that $(A - 2I)(A - 3I) = 0$, find the value of x.

10. Define Diagonal matrix and Scalar matrix.

11. $\begin{bmatrix} b-1 & 2 & 3 \\ 3 & 1 & 2 \\ 1 & -2 & 4 \end{bmatrix}$ is singular matrix, find the value of b

12. 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.

13. Find a unit vector along the direction of the vector $5\hat{i} - 3\hat{j} + 4\hat{k}$

14. Find the area of triangle whose vertices are A(1,0,0) B(0,1,0) C(0,0,1).

15. Consider the function $f(x) = \sqrt{x}$, $x \geq 0$. Does $\lim_{x \to 0} f(x)$ exist?

16. Evaluate : $\begin{vmatrix} 2014 & 2017 & 0 \\ 2020 & 2023 & 1 \\ 2023 & 2026 & 0 \end{vmatrix}$

Part - III

III. Answer any 5 questions. (Q.No.23 is compulsory) **5 x 3 = 15**

17. Prove that : $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x-y)(y-x)(z-x)$

18. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} + 2\vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3$, $|\vec{b}| = 4$, $|\vec{c}| = 7$, find the angle between $\vec{a}$ and $\vec{b}$

19. To prove : If any two rows / columns of a determinant are interchanged, then the determinant changes sign but its absolute value remains unaltered.

20. By using Sarrus Rule, find |A| : $A = \begin{bmatrix} 3 & 4 & 1 \\ 0 & -1 & 2 \\ 5 & -2 & 6 \end{bmatrix}$

21. To prove Section formula - Internal division.

22. Evaluate : $\lim\limits_{x \to 0} \frac{\sqrt{x+2} - \sqrt{2}}{x}$

23. Find the projection of $\overrightarrow{AB}$ on $\overrightarrow{CD}$ where A,B,C,D are the points (4,–3,0), (7,–5,–1), (–2,1,3), (0,2,5)

Part - IV

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

24. a) Express the matrix $A = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a symmetric and skew- symmetric matrix. *(OR)*

b) Compute all minors, cofactor of A and hence compute |A| if $A = \begin{bmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ -3 & 5 & 2 \end{bmatrix}$. Also check that |A| remains unaltered by expanding along any row or any column.

25. a) To prove by using Factors theorem :

$$|A| = \begin{vmatrix} (q+r)^2 & p^2 & p^2 \\ q^2 & (r+p)^2 & q^2 \\ r^2 & r^2 & (p+q)^2 \end{vmatrix} = 2pqr\,(p+q+r)^3$$

(OR)

b) Show that the vectors are coplanar : $\hat{i} - 2\hat{j} + 3\hat{k}$, $-2\hat{i} + 3\hat{j} - 4\hat{k}$, $-\hat{j} + 2\hat{k}$

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

b) The medians of a triangle are concurrent.

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