

* SECOND MID TERM TEST - 2024 *

Standard XI

Reg.No.

MATHEMATICS

Time : 1.30 hrs

Part - I

Marks : 50

8 x 1 = 8

I. Choose the correct answer:

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 $\vec{a} \cdot \vec{b} = 60^\circ =$

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) $\cos^{-1}(1/\sqrt{3})$

b) $\cos^{-1}(2/\sqrt{3})$

c) $\cos^{-1}(1/\sqrt{3})$

d) $\cos^{-1}(2/\sqrt{3})$

8. $\lim_{x \rightarrow \infty} \frac{a^x - b^x}{x} =$ a) $\log ab$ b) $\log(a/b)$ c) $\log(b/a)$ 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 $\lim_{x \rightarrow 0} f(x)$ 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 × 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 : $\lim_{x \rightarrow 0} \frac{\sqrt{x+2} - \sqrt{2}}{x}$

23. Find the projection of \overline{AB} on \overline{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 × 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 :

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

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 $10\hat{i} - \hat{j} + 6\hat{k}$ form a right angle triangle. (OR)

b) The medians of a triangle are concurrent.
