

FIRST MID TERM TEST - 2022**12** - Std**MATHEMATICS**Reg. No.

--	--	--	--	--	--

Time : 1.30 Hrs

Marks : 45

PART - I**Choose the correct answer.** $10 \times 1 = 10$

1. If $|\text{adj}(\text{adj}A)| = |A|^9$, then the order of the square matrix A is
1) 3 2) 4 3) 2 4) 5
2. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and $A(\text{adj } A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$ then K =
1) 0 2) $\sin \theta$ 3) $\cos \theta$ 4) 1
3. If $A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|\text{adj}(AB)| =$
1) -40 2) -80 3) -60 4) -20
4. If A is a non singular square matrix of order n, then $|\text{adj } A| =$
1) $|A|^{n-1}$ 2) $|A|^n$ 3) $|A|^{n+1}$ 4) n
5. The conjugate of a complex number is $\frac{1}{i-2}$ then the complex number is
1) $\frac{1}{i+2}$ 2) $\frac{-1}{i+2}$ 3) $\frac{-1}{i-2}$ 4) $\frac{1}{i-2}$
6. If $|z - 2 + i| \leq 2$ then the greatest value of $|z|$ is
a) $\sqrt{3} - 2$ 2) $\sqrt{3} + 2$ 3) $\sqrt{5} - 2$ 4) $\sqrt{5} + 2$
7. If α and β are the roots of $x^2 + x + 1 = 0$ then $\alpha^{2020} + \beta^{2020}$ is
1) -2 2) -1 3) 1 4) 2
8. $i^{1000} + i^{1001} + i^{1002} + i^{1003} =$
1) i 2) -i 3) 0 4) 1
9. A zero of $x^3 + 64$ is
1) 0 2) 4 3) 4i 4) -4
10. If α, β and γ are the zeros of $x^3 + px^2 + qx + r$, then $\sum \frac{1}{\alpha}$ is
1) $\frac{-q}{r}$ 2) $\frac{-p}{r}$ 3) $\frac{q}{r}$ 4) $\frac{-q}{p}$

PART - II**Answer any three questions. Q.No. 15 is compulsory.** $3 \times 2 = 6$

11. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.
12. $x + y = 3, 2x + 2y = 6$. Whether Cramer's Rule can be used? Give Reason.
13. If $Z_1 = 3 - 2i$ and $Z_2 = 6 + 4i$ find $\frac{Z_1}{Z_2}$ in the rectangular form.

12- MATHS PAGE - 1

14. Simplify : $i^{1947} + i^{1950}$.
15. Find a polynomial equation of minimum degree with rational coefficients, having $2 - \sqrt{3}i$ as a root.

PART - III**Answer any three questions. Q.No. 20 is compulsory.**

3 X 3 = 9

16. If $A = \begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$ verify that $A(\text{adj } A) = (\text{adj } A)A = |A| I_2$.

17. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$.

18. If $|z| = 2$ show that $3 \leq |z + 3 + 4i| \leq 7$.

19. Write in polar form of the complex number $3 - i\sqrt{3}$.

20. Form a polynomial equation with integer coefficients $\sqrt{\frac{2}{\sqrt{3}}}$ as a roots.

PART - IV

4 X 5 = 20

Answer all the questions.

21. a) Solve by Cramer's rule the system of equations

$$x_1 - x_2 = 3, 2x_1 + 3x_2 + 4x_3 = 17, x_2 + 2x_3 = 7 \quad (\text{OR})$$

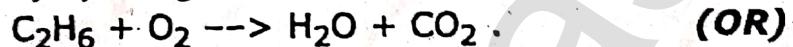
- b) $Z = x + iy$ is a complex member such that $\text{Im}\left(\frac{2z+1}{iz+1}\right) = 0$, show that the locus of z is $2x^2 + 2y^2 + x - 2y = 0$.

22. a) Solve the following system of linear equations by matrix inversion method.

$$x + y + z - 2 = 0; 6x - 4y + 5z - 31 = 0; 5x + 2y + 2z = 13. \quad (\text{OR})$$

- b) Find the cube roots of $\sqrt{3} + i$.

23. a) By using Gaussian elimination method, balance the chemical reaction equation



- b) Show that the points, $1, \frac{-1}{2} + i\frac{\sqrt{3}}{2}$ and $\frac{-1}{2} - i\frac{\sqrt{3}}{2}$ are the vertices of a

equilateral triangle.

24. a) Investigate for what values of λ and μ the system of linear equations $x + 2y + z = 7, x + y + \lambda z = \mu, x + 3y - 5z = 5$ has

- i) No solution ii) a unique solution iii) an infinite number of solutions (OR)

- b) If $\cos \alpha = x + \frac{1}{x}$ and $2 \cos \beta = y + \frac{1}{y}$ show that.

$$\text{i)} \frac{x}{y} + \frac{y}{x} = 2 \cos(\alpha - \beta) \quad \text{ii)} xy - \frac{1}{xy} = 2i \sin(a + b).$$