FIRST MID TERM TEST - 2022

12 - Std **MATHEMATICS** Reg. No.

Time : 1.30 Hrs Marks : 45

PART - I

Choose the correct answer. 10 x 1 = 10

1. If $|adj\,(adjA)| = |A|^9$, 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 (adj A) = $\begin{bmatrix} k & o \\ o & k \end{bmatrix}$ then K =
   1) 0 2) sin θ 3) cos θ 4) 1

3. If A = $\begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then |adj (AB)|=
   1) −40 2) −80 3) −60 4) −20

4. If A is a non singular square matrix of order n, then |adj A| =
   1) $|A|^{n-1}$ 2) $|A|^n$ 3) $|A|^{n+1}$ 4) n

5. The conjucate 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 $\Sigma\frac{1}{\alpha}$ 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 X 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.

14. Simplify : $i^{1947} + i^{1950}$.

15. Find a polynomial equation of minimum degree with rational coefficients, havin[g] $2-\sqrt{3}i$ as a root.

PART - III

Answer any three questions. Q.No. 20 is compulsory. 3 X 3 = !

16. If $A=\begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$ verify that A (adj A) = (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 $3 \le |z+3+4i| \le 7$.

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

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

PART - IV

Answer all the questions. 4 X 5 = 2

21. a) Solve by Cramer's rule the system of equations $x_1 - x_2 = 3,\ 2x_1 + 3x_2 + 4x_3 = 17,\ x_2 + 2x_3 = 7$ ***(OR)***

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

22. a) Solve the following system of linear equations by matrix *inversion method.* $x + y + z - 2 = 0$; $6x - 4y + 5z - 31 = 0$; $5x + 2y + 2z = 13$. ***(OR)***

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

23. a) By using Gaussian elimination method, balance the chemical reaction equatio $C_2H_6 + O_2 \dashrightarrow H_2O + CO_2$. ***(OR)***

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

24. a) Investigate for what values of λ and μ the system of linear equatior $x + 2y + z = 7,\ x + y + \lambda z = \mu,\ x + 3y - 5z = 5$ has i) No solution ii) a unique solution iii) an infinite number of solutions ***(OR)***

b) If cos α = $x + \frac{1}{x}$ and 2 cos β = $y + \frac{1}{y}$ show that.

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