Ts12M

Time: 1.30 Hours

**Standard 12
MATHEMATICS
PART - A**

Marks: 45

I. Choose the correct answer: $10 \times 1 = 10$

1) If $A^T A^{-1}$ is symmetric then $A^2 =$

   a) A^T b) $(A^T)2$ c) A^T d) $(A^{-1})^2$

2) If $A = \begin{pmatrix} 2 & 0 \\ 1 & 5 \end{pmatrix}$ & $B = \begin{pmatrix} 1 & 4 \\ 2 & 0 \end{pmatrix}$ then $|adj(AB)| =$

   a) -40 b) -80 c) -60 d) -20

3) If A is a 3×3 non-singular matrix such that $AA^T = A^T A$ & $B = A^{-1} A^T$ then $BB^T =$

   a) A   b) B   c) I_3 d) B^T

4) Product of all four values of $\left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}\right)^{3/4}$ is

   a) -2 b) -1 c) 1 d) 2

5) If $\dfrac{z-1}{z+1}$ is purely imaginary then $|z|$ is

   a) $\frac{1}{2}$ b) 1 c) 2 d) 3

6) $i^n + i^{n+1} + i^{n+2} + i^{n+3}$ is

   a) 0 b) 1 c) -1 d) i

7) If $z = x + iy$ is a complex number such that $|z + 2| = |z - 2|$ then the locus of z is

   a) real axis   b) imaginary axis   c) ellipse   d) circle

8) The number of positive zeros of the polynomial $\sum\limits_{r=0}^{n} nC_r (-1)^r x^r$ is

   a) 0 b) n c) $< n$ d) r

9) The number of real numbers in $[0, 2\pi]$ satisfying $\sin^4 x - 2\sin^2 x + 1$ is

   a) 2 b) 4 c) 1 d) ∞

10) According to the rational root theorem which number is not possible rational zero of $4x^7 + 2x^4 - 10x^3 - 5$

   a) -1 b) $\frac{5}{4}$ c) $\frac{4}{5}$ d) 5

PART - B

II. Answer any 4 questions: Q.No. 15 is compulsory. $4 \times 2 = 8$

11) Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{pmatrix}$

12) S.T $\left(2 + i\sqrt{3}\right)^{10} + (2 - i\sqrt{3})^{10}$ is real

13) If $w \neq 1$ is a cube root of unity. S.T $(1 - \omega + \omega^2)^6 + (1 + \omega - \omega^2)^6 = 128$

14) S.T the polynomial $9x^9 + 2x^5 - x^4 - 7x^2 + 2$ has atleast six imaginary roots.

15) If A is a non-Singular matrix of odd order P.T |adj A| is positive

PART - C

III. Answer any 4 questions: Q.No. 20 is compulsory.   4×3=12

16) If adj $A = \begin{pmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{pmatrix}$ find A^{-1}

17) Four men & four women can finish a piece of work jointly in 3 days while 2 men & 5 women can finish the same work jointly in 4 days. Find the time taken by one man alone & that of one woman alone to finish the same work by using matrix inversion method.

18) If $|z| = 2$ S.T $3 \leq |z + 3 + 4i| \leq 7$

19) If $\dfrac{z+3}{z-5i} = \dfrac{1+4i}{2}$ find the complex number z in the rectangular form

20) If α, β, γ are roots of the equation $x^3 + px^2 + qx + r = 0$ find the value of $\sum \dfrac{1}{\beta\gamma}$ interms of the coefficients.

PART - D

IV. Answer all the questinos.   3×5=15

21) a) Investigate the values of λ, μ the system of linear equation $2x + 3y + 5z = 9$, $7x + 3y - 5z = 8$, $2x + 3y + \lambda z = \mu$ have

     i) no solution   ii) a unique solution   iii) an infinite number of solution

(OR)

b) Solve the sytem of linear equations by Cramer's rule

     $3x + 3y - z = 11$; $2x - y + 2z + 9$; $4x + 3y + 2z = 25$

22) a) If $z = x + iy$ is a complex number such that $Im\left(\dfrac{2z+1}{iz+1}\right) = 0$. S.T. the locus of z is $2x^2 + 2y^2 + x - 2y = 0$

(OR)

b) If $\dfrac{1+z}{1-z} = \cos 2\theta + i \sin 2\theta$ S.T $z = i \tan \theta$

23) a) Find the sum of squares of the roots of $ax^4 + bx^3 + cx^2 + dx + e = 0$, $a \neq 0$

(OR)

b) Solve $6x^4 - 35x^3 + 62x^2 - 35x + 6 = 0$

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