V12M

Virudhunagar District
Common First Mid Term Test - 2024

Standard 12
MATHS

Time: 1.30 Hours Marks: 50

Part - I

Answer all the questions: 10×1=10

1) If $A = \begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$ then $9I_2 - A =$

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

2) If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $\lambda A^{-1} = A$ then λ is

a) 17 b) 14 c) 19 d) 21

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

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

4) The rank of matrix $\begin{bmatrix} -1 & 3 \\ 4 & -7 \\ 3 & -4 \end{bmatrix}$ is ....

a) 1 b) 2 c) 3 d) None of these

5) If $|z| = 1$, then the value of $\frac{1+z}{1+\bar{z}}$ is ....

a) z b) $\bar{z}$ c) $\frac{1}{z}$ d) 1

6) If $\frac{z-1}{z+1}$ is purely imaginary, then $|z|$ is ....

a) $1/2$ b) 1 c) 2 d) 3

7) $z^2 = \bar{z}$ has .... solutions.

a) 1 b) 2 c) 3 4) 4

8) If z is a complex number such that $z \in C \backslash R$ and $z + \frac{1}{z} \in R$ then $|z|$ is

a) 0 b) 1 c) 2 d) 3

9) A zero of $x^3 + 64$ is

a) 0 b) 4 c) 4i d) −4

10) The number of positive zeros of the polynomial $\sum_{r=0}^{n} nC_r (-1)^r x^r$

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

Part - II

Answer any four questions only: 4×2=8

11) If A is non-Singular matrix of odd order, Prove that |adj A| is positive

12) Solve $\frac{3}{x} + 2y = 12$, $\frac{2}{x} + 3y = 13$ by Crammer's rule

13) Simplify : $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$ into rectangular form

14) Find the square root of $-5-12i$

15) If $x^2 + 2(k+2)x + 9k = 0$ has equal roots find k.

16) Show that the equation $x^9 - 5x^5 + 4x^4 + 2x^2 + 1 = 0$ has atleast 6 imaginary solutions.

Part - III

Answer any four questions only: **4×3=12**

17) Find a matrix A if adj A = $\begin{bmatrix} 7 & 7 & -7 \\ -1 & 11 & 7 \\ 11 & 5 & 7 \end{bmatrix}$

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

19) If $z_1 = 2 - i$ and $z_2 = -4 + 3i$, find the inverse of z_1z_2 and $\frac{z_1}{z_2}$

20) Simplify : $\left(\sin\frac{\pi}{6} + i\cos\frac{\pi}{6}\right)^{18}$

21) If p and q are the roots of the equation $lx^2 + nx + n \geq 0$, show that $\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{r}} + \sqrt{\frac{n}{l}} = 0$

22) If the roots of $x^3 + px^2 + qx + r = 0$ are in G.P., Prove that $9pqr = 27r^2 + 2q^3$, where $p, q, r \neq 0$

Part - IV

Answer any four questions only: **4×5=20**

23) Solve $\frac{3}{x} - \frac{4}{y} - \frac{2}{z} - 1 = 0$, $\frac{1}{x} + \frac{2}{y} + \frac{1}{z} - 2 = 0$, $\frac{2}{x} - \frac{5}{y} - \frac{4}{z} + 1 \geq 0$ by Cramer's rule.

24) Investigate for what values of λ and μ the sytem 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.

25) If z_1, z_2 and z_3 be complex numbers such that $|z_1| = |z_2| = |z_3| = r > 0$ and $z_1 + z_2 + z_3 \neq 0$ prove that $\left|\frac{z_1z_2 + z_2z_3 + z_3z_1}{z_1 + z_2 + z_3}\right| = r$

26) Solve the equation $z^3 + 27 = 0$

27) Find all zeros of the polynomial $x^6 - 3x^5 - 5x^4 + 22x^3 - 39x^2 - 39x + 135$, if it is known that $1 + 2i$ and $\sqrt{3}$ are two of its zeros.

28) Solve the equation $6x^4 - 5x^3 - 38x^2 - 5x + 6 = 0$ if it is knows that $\frac{1}{3}$ is a solution.