Ts12M

Tenkasi District

Common First Mid Term Test - 2023

09-08-2023   **Standard 12**

Time: 1.30 Hrs.   **MATHEMATICS**   Marks: 45

Part - A

Answer all the questions. Choose the correct answer: **10×1=10**

1) If the order of a square matrix A is 4 and $|A| = 5$, then $|adj\ (adj\ A)|$ is
   a) 25   b) 5^4 c) 125   d) 5

2) If A, B and C are invertible matrices of some order, then which one of the following is not true?
   a) $adj\ A = |A|A^{-1}$ b) $adj(AB) = (adj\ A)\ (adj\ B)$
   c) $det\ A^{-1} = (det\ A)^{-1}$ d) $(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$

3) If $\rho(A) = \rho(A/B)$, then the system $AX = B$ of linear equations is
   a) Consistent and has a unique solution
   b) Consistent
   c) Consistent and has infinitely many solution
   d) Inconsistent

4) If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and $A(adjA) = \begin{bmatrix} K & 0 \\ 0 & K \end{bmatrix}$, then $K =$
   a) 0   b) $\sin\theta$ c) $\cos\theta$ d) 1

5) The conjugate of a complex number is $\dfrac{1}{i-2}$, Then the complex number is
   a) $\dfrac{1}{i-2}$ b) $\dfrac{-1}{i-2}$ c) $\dfrac{-1}{i-2}$ d) $\dfrac{1}{i-2}$

6) If $\left|Z - \dfrac{3}{Z}\right| = 2$, then the least value of $|Z|$ is
   a) 1   b) 2   c) 3   d) 5

7) If $(1+i)\ (1+2i)\ (1+3i) \ldots (1+ni) = x+iy$, then $2.5.10\ldots(1+n^2)$ is
   a) 1   b) 2   c) x^2+y^2 d) $1+n^2$

8) Multiplication of a complex number 'Z' by $(-i)$ is the rotation about the origin by
   a) 90° counter clockwise direction   b) 90° clockwise direction
   c) 180° counter clockwise direction   d) 180° clockwise direction

9) A zero of x^3+64 is
   a) 0   b) 4   c) 4i   d) −4

10) If α, β and γ are the zeros of x^3+px^2+qx+r then $\sum 1/\alpha$ is,
    a) $\dfrac{-q}{r}$ b) $\dfrac{-p}{r}$ c) $\dfrac{q}{r}$ d) $\dfrac{-q}{p}$

Part - B

Answer 4 questions. Question No. 15 is compulsory: **4×2=8**

11) If $adj\ A = \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, find A^{-1}.

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

13) Show that $|3z-5+i| = 4$ represents a circle and find its centre and radius.
14) Determine the number of positive and negative roots of the equation.
   $$x^9-5x^8-14x^7 = 0$$
15) Solve the following system of linear equations using matrix inversion method:
   $$2x-y = 3, \quad 5x+y = 4$$

Part - C
Answer 4 questions. Qn.No. 20 is compulsory: 4×3=12

16) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$ by reducing it to a row-echelon form.

17) Find the values of the real numbers x and y, if the complex numbers.
   $(3-i)x-(2-i)y+2i+5$ and $2x+(-1+2i)y+3+2i$ are equal.

18) Solve the equation $9x^3-36x^2+44x-16 = 0$ if the roots form an arithmetic progression.

19) Solve the equation $7x^3-43x^2 = 43x-7$.

20) Find the square root of $5-12i$.

Part - D
Answer all the questions: 3×5=15

21) a) In a T20 match, a team needed just 6 runs to coin with 1 ball left to go in the last over. The last ball was bowled and the batsman at the increase, hit it high up. The ball traversed along a path in a vertical plane and the equation of the path is $y = ax^2+bx+c$ with respect to a xy-co-ordinate system in the vertical plane and the ball traversed through the points (10, 8), (20, 16), (30, 18), can you conclude that Chennai Super Kings won the match? Justify your answer. (All distances are measured in metres and the meeting point of the plane of the path with the farthest boundary line is (70, 0)).

(OR)

b) If $2\cos\alpha = x+\dfrac{1}{x}$ and $2\cos\beta = y+\dfrac{1}{y}$, show that

   (i) $\dfrac{x}{y}-\dfrac{y}{x} = 2i\sin(\alpha - \beta)$ (ii) $\dfrac{x^m}{y^n}-\dfrac{y^n}{x^m} = 2\cos(m\alpha - n\beta)$

22) a) Find the value of K for which the equations $Kx-2y+z = 1$, $x-2ky+z = -2$, $x-2y+Kz = 1$ have (i) No solution (ii) Unique solution (iii) Infinitely many solution.   **(OR)**

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

23) a) If $Z = x+iy$ is a complex number such that $\text{Im}\left[\dfrac{2Z+1}{iZ+1}\right] = 0$, show that the locus of Z is $2x^2+2y^2+x-2y = 0$.

(OR)

b) Find the inverse of the non-singular matrix $A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}$ by Gauss-Jordan method.

- - - - - - - -