ROYAL TUITION CENTER, ELAMPILLAI, CELL: 9080244280

CLASS   : XII   MARKS   : 70

SUBJECT   : MATHS   TIME   : 150 Min

I. ANSWER ANY 10 QUESTIONS   10x2 = 20

1. Find the inverse of the matrix $\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$.

2. If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -3 \\ 5 & 2 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

3. Reduce the matrix $\begin{bmatrix} 0 & 3 & 1 & 6 \\ -1 & 0 & 2 & 5 \\ 4 & 2 & 0 & 0 \end{bmatrix}$ to a row-echelon form.

4. Find the inverse of the non-singular matrix $A = \begin{bmatrix} 0 & 5 \\ -1 & 6 \end{bmatrix}$, by Gauss-Jordan method.

5. Solve the following system of linear equations by matrix inversion method:
    (i) $2x + 5y = -2, \quad x + 2y = -3$

6. Solve the following systems of linear equations by Gaussian elimination method:

    (i) $2x - 2y + 3z = 2, \quad x + 2y - z = 3, \quad 3x - y + 2z = 1$

7. Simplify the following: $\sum_{n=1}^{10} i^{n+50}$

8. Simplify $\left(\dfrac{1+i}{1-i}\right)^3 - \left(\dfrac{1-i}{1+i}\right)^3$. into rectangular form

9. If $|z| = 2$ show that $3 \le |z + 3 + 4i| \le 7$

10. Find the square roots of (i) $4 + 3i$

11. Obtain the Cartesian form of the locus of $z = x + iy$ in each of the following cases:
    (i) $\left[\operatorname{Re}(iz) \right]^2 = 3$

12. Represent the complex number (i) $-1 - i$

II. ANSWER ANY 10 QUESTIONS. 20 AND 21 IT'S A COMPULSORY QUESTIONS   10x5 =50

13. Find all cube roots of $\sqrt{3}+i$.

14. Find the rectangular form of the complex numbers

(i) $\left(\cos\dfrac{\pi}{6}+i\sin\dfrac{\pi}{6}\right)\left(\cos\dfrac{\pi}{12}+i\sin\dfrac{\pi}{12}\right)$ (ii) $\dfrac{\cos\dfrac{\pi}{6}-i\sin\dfrac{\pi}{6}}{2\left(\cos\dfrac{\pi}{3}+i\sin\dfrac{\pi}{3}\right)}$

15. Show that the equation $z^3+2\bar{z}=0$ has five solutions.

16. If $z=x+iy$ and $\arg\left(\dfrac{z-1}{z+1}\right)=\dfrac{\pi}{2}$, show that $x^2+y^2=1$.

17. If $z_1=3+4i,\ z_2=5-12i,$ and $z_3=6+8i$, find $|z_1|,\ |z_2|,\ |z_3|,\ |z_1+z_2|,\ |z_2-z_3|,$ and $|z_1+z_3|$.

18. 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.

19. An amount of ₹ 65,000 is invested in three bonds at the rates of 6%, 8% and 10% per annum respectively. The total annual income is ₹ 4,800. The income from the third bond is ₹ 600 more than that from the second bond. Determine the price of each bond. (Use Gaussian elimination method.)

20. A chemist has one solution which is 50% acid and another solution which is 25% acid. How much each should be mixed to make 10 litres of a 40% acid solution ? (Use Cramer's rule to solve the problem).

21. 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 woman alone to finish the same work by using matrix inversion method.

22. Show that the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 2 & 0 & -1 \\ 5 & 2 & 1 \end{bmatrix}$ is non-singular and reduce it to the identity matrix by elementary row transformations.

23. If $A=\dfrac{1}{7}\begin{bmatrix} 6 & -3 & a \\ b & -2 & 6 \\ 2 & c & 3 \end{bmatrix}$ is orthogonal, find a,b and c, and hence A^{-1}.

24. By using Gaussian elimination method, balance the chemical reaction equation:
$C_2H_6+O_2 \rightarrow H_2O+CO_2$