VINAYAGA TUITION CENTRE ANAIMALAI

UNIT TEST

MATHEMATICS

CLASS: 12
TIME: 1.30Hrs **MARKS: 50**

I. Choose the best answer **10x1=10**

1. If $|adj(adj\ A)| = |A|^9$, then the order of the square matrix A is
   (a) 3 (b) 4 (c) 2 (d) 5
2. If A is a 3 x 3 non – singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then $B\,B^T =$
   (a) A (b) B (c) I_3 (d) B^T
3. If $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, B = adj A and C = 3A, then $\frac{|adj\ B|}{|C|} =$
   (a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{1}{4}$ (d) 1
4. If $A = \begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ and If $A = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then $|adj\ AB| =$
   (a) -40 (b)-80 (c)-60 (d)-20
5. If $P = \begin{bmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & -2 \end{bmatrix}$ is the adjoint of 3x3 matrix A and $|A| = 4$, then x is
   (a) 15 (b) 12 (c) 14 (d) 11
6. 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
7. If $A = \begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ x & \frac{3}{5} \end{bmatrix}$ and $A^T = A^{-1}$, then the value of x is
   (a) $\frac{-4}{5}$ (b) $\frac{-3}{5}$ (c) $\frac{3}{5}$ (d) $\frac{4}{5}$
8. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and A (adj A) $= \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then k =
   (a) 0 (b) $\sin\theta$ (c)$\cos\theta$ (d)1
9. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ -1 & -2 & -3 & -4 \end{bmatrix}$ is
   (a) 1 (b) 2 (c) 4 (d) 3
10. 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) $2A^{-1}$

II.Answer the following questions **4x2=8**

11. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is non – singular, find A^{-1}.
12. If A is a non – singular matrix of odd order, prove that $|adj\ A|$ is Positive.

13. Find the adjoint $\begin{bmatrix} -3 & 4 \\ 6 & 2 \end{bmatrix}$

14. Solve the systems of linear equations by Cramer's rule

III.Answer the following questions **4x3=12**

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

16. Verify the property $(A^T)^{-1} = (A^{-1})^T$ with A = $\begin{bmatrix} 2 & 9 \\ 1 & 7 \end{bmatrix}$

17. Solve the systems of linear equations by matrix inversion method.

    $2x + 3y - z = 9$, $x + y + z = 9$, $3x - y - z = -1$.

18. Solve the systems of linear equations by Gaussian elimination method.

    $4x + 3y + 6z = 25$, $x + 5y + 7z = 13$, $2x + 9y + z = 1$.

IV.Answer the following question **4x5=20**

19. If the system of equations $px + by + cz = 0$, $ax + qy + cz = 0$, $ax + by + rz = 0$ has a non – trivial Solution and $p \neq a$, $q \neq b$, $r \neq c$, Prove that $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} = 2$.

20. 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.

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

22. By using Gaussian elimination method, balance the chemical reaction equation.

    $C_2H_6 + O_2 \rightarrow H_2O + CO_2$.

Mr.S.MEGANATHAN M.Sc.,M.Ed.,
VINAYAGA TUITION CENTRE
ANAIMALAI-642104
PH:7502638443

VINAYAGA TUITION CENTRE ANAIMALAI

UNIT TEST(CHAPTER 2)

MATHEMATICS

CLASS: 12
TIME: 1.30Hrs **MARKS: 50**

I. Choose the best answer **10x1=10**

1. $i^n + i^n + i^{n+2} + i^{n+3}$ is
   (a) 0 (b) 1 (c) -1 (d) i
2. If z is a non – zero complex number, such that $2iz^2 = \bar{z}$ then $|z|$ is
   (a) $\frac{1}{2}$ (b)1 (c) 2 (d) 3
3. The value of $\sum_{i=1}^{13}(i^n + i^{n-1})$ is
   (a)1 + i (b) i (c)1 (d)0
4. If $\left|z - \frac{3}{z}\right| = 2$, then the least value of $|z|$ is
   (a) 1 (b) 2 (c) 3 (d) 5
5. If z is a complex number such that $z \in \mathbb{C}/\mathbb{R}$ and $z + \frac{1}{z} \in \mathbb{R}$, then $|z|$ is
   (a) 0 (b) 1 (c) 2 (d) 3
6. 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
7. If = $\frac{(\sqrt{3}+i)^3 + (3i+4)^2}{(8+6i)^2}$, then $|z|$ is equal to
   (a) 0 (b) 1 (c) 2 (d) 3
8. If $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ and $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|z_1 + z_2 + z_3|$ is
   (a) 1 (b) 2 (c) 3 (d) 4
9. The area of triangle formed by the complex numbers z, iz, and z + iz in the Argand 's diagram is
   (a) $\frac{1}{2}|z|^2$ (b) $|z|^2$ (c) $\frac{3}{2}|z|^2$ (d) $2|z|^2$
10. If $\frac{z-1}{z+1}$ is purely imaginary, then $|z|$ is
    (a) $\frac{1}{2}$ (b) 1 (c) 2 (d) 3

II.Answer the following questions any four **4x2=8**

11. Evaluate the following if z = 5 – 2i and w = -1+ 3i
    (i) z w (ii) 2z + 3w
12. Simplify $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$. into rectangular form
13. Which one of the points i , -2 + i, and 3 is farthest from the origin?
14. Which one of the points 10 - 8i, 11 + 6i is closest to 1 + i.
15. If z =$(\cos\theta + i\sin\theta)$, show that $z^n + \frac{1}{z^n} = 2\cos n\theta$ and and $z^n - \frac{1}{z^n} = 2i\sin n\theta$.
16. Find the principal argument Arg z, when z = $\frac{-2}{1+i\sqrt{3}}$.

III. Answer the following questions any four **4x3=12**

17. Find the value of the real numbers x and y, if the complex number (2 + i)x +(1 – i)y + 2i – 3 and x + (-1 + 2i)y + 1 + i are equal.

18. The complex numbers u, v and w are related by $\frac{1}{u} = \frac{1}{v} + \frac{1}{w}$. if v=3-4i and w=4+3i find u in rectangular form
19. If z_1, z_2 and z_3 are complex numbers such that $|z_1| = |z_2| = |z_3| = |z_1 + z_2 + z_3| = 1$, Find the value of $\left|\frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3}\right|$.
20. Show that $|3z - 5 + i| = 4$ represents a circle and find its centre and radius.
21. Find the product $\frac{3}{2}\left(cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right) . 6 \left(cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6}\right)$ in rectangular from.
22. Show that $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5 = -\sqrt{3}$.

IV. Answer the following questions any four **4x5=20**

23. Show that (i) $\left(2 + i\sqrt{3}\right)^{10} + \left(2 - i\sqrt{3}\right)^{10}$ is real and (ii) $\left(\frac{19+9i}{5-3i}\right)^{15} - \left(\frac{8+i}{1+2i}\right)^{15}$ is Purely imaginary.
24. Let 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 $\left|\frac{z_1z_2+z_2z_3+z_3z_1}{z_1+z_2+z_3}\right|$.
25. If $z = x + iy$ and $\arg\left(\frac{z-i}{z+2}\right) = \frac{\pi}{4}$, show that $x^2 + y^2 + 3x - 3y + 2 = 0$.
26. If $cos\alpha + \cos\beta + cos\gamma = \sin\alpha + \sin\beta + \sin\gamma = 0$, show that
    (i) $\cos 3\alpha + \cos 3\beta + \cos 3\gamma = 3\cos(\alpha + \beta + \gamma)$
27. Find all cube roots of $\sqrt{3}$ + i.
28. Find the value of $\sum_{k=1}^{8}\left(cos\frac{2k\pi}{9} + i\sin\frac{2k\pi}{9}\right)$.

S.MEGANATHAN M.Sc.,M.Ed.,
VINAYAGA TUITION CENTRE
ANAIMALAI
POLLACHI
COIMBATORE-642104
CELL:7502638443