T Thiruvarur District - FIRST MID TERM TEST - JULY 2019

STANDARD - XII

MATHEMATICS

TIME: 1.15 hours **MARKS - 45**

PART - A

I. CHOOSE THE CORRECT ANSWER: **10 × 1 = 10**

1. If adj $A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ and adj $B = \begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$ then adj (AB) is

(a) $\begin{bmatrix} -7 & -1 \\ 7 & -9 \end{bmatrix}$ (b) $\begin{bmatrix} -6 & 5 \\ -2 & -10 \end{bmatrix}$ (c) $\begin{bmatrix} -7 & 7 \\ -1 & -9 \end{bmatrix}$ (d) $\begin{bmatrix} -6 & -2 \\ 5 & -10 \end{bmatrix}$

2. The augmented matrix of a system of linear equation is $\begin{bmatrix} 1 & 2 & 7 & 3 \\ 0 & 1 & 4 & 6 \\ 0 & 0 & \lambda-7 & \mu+5 \end{bmatrix}$. The system has infinitely many solutions if

(a) $\lambda = 7, \mu \neq -5$ (b) $\lambda = -7, \mu = 5$ (c) $\lambda = 7, \mu = -5$ (d) $\lambda \neq 7, \mu \neq -5$

3. The value of $\sum_{i=1}^{13} \left(i^n + i^{n-1}\right) =$

(a) $1 + i$ (b) i (c) 1 (d) 0

4. The principal argument of $\left[\sin 40^o + i \cos 40^o\right]^5$ is

(a) -110° (b) -70° (c) 70° (d) 110°

5. If $w \neq 1$ is a cubic root of unity and $(1 + w^2)^{11} = a + bw + cw^2$, then (a, b, c) equals

(a) (1, 1, 0) (b) (0, 1, 1) (c) (1, 0, 1) (d) (1, 1, 1)

6. If α, β and δ are the zeros of $x^3 + px^2 + qx + r$ then $\sum \frac{1}{\alpha}$ is

(a) $\frac{-q}{r}$ (b) $\frac{-p}{r}$ (c) $\frac{q}{r}$ (d) $\frac{-q}{p}$

7. If p and q are roots of $x^2 + px + q = 0$ then

(a) p = 1 (b) p = 1 or 0 (c) p = -2 (d) p = -2 or 0

8. If $x = \frac{1}{5}$; the value of $\cos\left[\cos^{-1} x + 2\sin^{-1} x\right]$

(a) $-\sqrt{\frac{24}{25}}$ (b) $\sqrt{\frac{24}{25}}$ (c) $\frac{1}{5}$ (d) $\frac{-1}{5}$

9. If $\sin^{-1}\frac{x}{5}+\cos ec^{-1}\frac{5}{4}=\frac{\pi}{2}$, then the value of x is

(a) 4 (b) 5 (c) 2 (d) 3

10. The principal value of $\tan^{-1}\left[\cot\frac{43\pi}{4}\right]$ is

(a) $\frac{-3\pi}{4}$ (b) $\frac{3\pi}{4}$ (c) $\frac{\pi}{4}$ (d) $\frac{-\pi}{4}$

PART - B

II. Answer FOUR questions. Q.No. 16 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. Find the inverse of $\begin{bmatrix}2 & -1\\ 5 & -2\end{bmatrix}$ by Gauss - Jordan method.

13. 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.

14. Simplify: $\left[\sin\frac{\pi}{6}+i\cos\frac{\pi}{6}\right]^{18}$

15. If α, β, and δ are the roots of the equation $x^3 + px^2 + qx + r = 0$, find the value of $\sum\frac{1}{\beta r}$ in terms of the co - efficients.

16. Find the value of $\cos\left[\cos^{-1}(4/5)+\sin^{-1}(4/5)\right]$.

PART - C

III. Answer FOUR questions: Q.No. 22 is compulsory: **4 × 3 = 12**

17. Find the rank of $\begin{bmatrix}1 & 2 & -1\\ 3 & -1 & 2\\ 1 & -2 & 3\\ 1 & -1 & 1\end{bmatrix}$ by row reduction method.

18. If $z = x + iy$ is a complex number such that $\left|\frac{z-4i}{z+4i}\right|=1$, show that the locus of z is real axis.

19. Solve: $(x - 5)(x - 7)(x + 6)(x + 4) = 504$.

20. Find the value of $\sec^{-1}\left[\frac{-2\sqrt{3}}{3}\right]$.

21. If $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find the matrix A.

22. Solve the equation $z^3 + 27 = 0$.

PART - D

IV. Answer ALL the Questions: $3 \times 5 = 15$

23. In a competitive examination, one mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student answered 100 questions and got 80 marks. How many questions did he answer correctly? [Use Cramer's rule to solve].

(OR)

If $ax^2 + bx + c$ is divided by $x + 3$, $x - 5$ and $x - 1$, the remainders are 21, 61 and 9 respectively. Find a, b and c [Use Gaussian elimination method]

24. If $z = x + iy$ and $\arg\left[\frac{z-i}{z+2}\right] = \frac{\pi}{4}$ then show that $x^2 + y^2 + 3x - 3y + 2 = 0$.

(OR)

If $2\cos\alpha = x + \frac{1}{x}$ and $2\cos\beta = y + \frac{1}{y}$ show that

(i) $x^m y^n + \frac{1}{x^m y^n} = 2\cos(m\alpha + n\beta)$

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

25. If α, β, and δ are the roots of the polynomial equation $ax^3 + bx^2 + cx + d = 0$, find the value of $\sum \frac{\alpha}{\beta\delta}$ in terms of the co - efficients.

(OR)

Prove that $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \tan^{-1}\left[\frac{x + y + z - xyz}{1 - xy - yz - zx}\right]$.

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