Ts-12M

TENKASI

Tenkasi District Common Examinations

Common First Mid Term Test - 2022

Standard 12

MATHEMATICS

Time: 1.30 Hrs. Marks: 45

Part - A

I. Answer the following questions: **10×1=10**

1) If $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, B = adj A and C = 3A then, $\frac{|adjB|}{|C|}$ = _____.

a) $\frac{1}{9}$ b) $\frac{1}{4}$ c) $\frac{1}{3}$ d) 1

2) If $A = \begin{bmatrix} 1 & \tan\theta/2 \\ -\tan\theta/2 & 1 \end{bmatrix}$ and $AB = I_2$, then B = _____.

a) $(\cos^2\theta)I$ b) $(\sin^2\theta/2)A$ c) $(\cos\theta/2)A$ d) $(\cos^2\theta/2)A^T$

3) If $\sin^{-1}x = 2$, $\sin^{-1}\alpha$ has a solution, then _____.

a) $|x| \geq \frac{1}{\sqrt{2}}$ b) $|x| < \frac{1}{\sqrt{2}}$ c) $|x| > \frac{1}{\sqrt{2}}$ d) $|x| \leq \frac{1}{\sqrt{2}}$

4) The polynomial x^3+2x+3 has

a) no zeros

b) three real zeros

c) one negative and two imaginary zeros

d) one positive and two imaginary zeros

5) If $|z-2+i| \leq 2$, then the greatest value of $|z|$ is _____.

a) $\sqrt{5}-2$ b) $\sqrt{5}+2$ c) $\sqrt{3}-2$ d) $\sqrt{3}+2$

6) $\tan^{-1}\left(\frac{1}{4}\right)+\tan^{-1}\left(\frac{2}{9}\right)$ is equal to _____.

a) $\frac{1}{2}\tan^{-1}\left(\frac{3}{5}\right)$ b) $\tan^{-1}\left(\frac{1}{2}\right)$ c) $\frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$ d) $\frac{1}{2}\sin^{-1}\left(\frac{3}{5}\right)$

7) Which of the following is incorrect?

a) $|Z_1+Z_2| \leq |Z_1|-|Z_2|$ b) $|Z_1-Z_2| \leq |Z_1|+|Z_2|$

c) $|Z_1-Z_2| \geq |Z_1|-|Z_2|$ d) $|Z_1+Z_2| \geq |Z_1|+|Z_2|$

8) If α and β are the roots of $x^2+x+1 = 0$, then $\alpha^{2020}+\beta^{2020}$ is

a) 2 b) 1 c) -1 d) -2

9) If A is a matrix of order 3×4, then $\rho(A)$ is _____.

a) ≤4 b) ≤3 c) =3 d) =4

10) If α, β and γ are the zeros of x^3+px^2+qx+r then $\Sigma 1/\alpha$ is,

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

Part - B

II. Answer any 4 questions: **4×2=8**

11) Find a polynomial equation of minimum degree with rational coefficients, having 2i+3 as a root.

12) Is $\cos^{-1}(-x) = \pi - \cos^{-1}(x)$ true? Justify your answer.

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

14) Find the square root of $-6+8i$.

15) Solve the following system of linear equations using matrix inversion method:
$7x+3y+1 = 0,\ 2x+y = 0$.

Part - C

III. Answer any four questions: **4×3=12**

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

17) If $2\cos\alpha = x + \frac{1}{x}$ and $2\cos\beta = y + \frac{1}{y}$, show that $xy + \frac{1}{xy} = 2\cos(\alpha+\beta)$.

18) Show that $\left(2+i\sqrt{3}\right)^{10} - \left(2-\sqrt{3}\right)^{10}$ is purely imaginary.

19) Solve the cubic equation: $2x^3+9x^2+10x = 3$

20) Find the domain of $\frac{[\cos^{-1}(2+\sin x)]}{3}$.

Part - D

IV. Answer all the questions: **3×5=15**

21) a) Solve the following system of linear equations by Cramer's rule:

$$\frac{3}{x} - \frac{4}{y} - \frac{2}{z} - 1 = 0,\quad \frac{1}{x} + \frac{2}{y} + \frac{1}{z} - 2 = 0,\quad \frac{2}{x} - \frac{5}{y} - \frac{4}{z} + 1 = 0$$

(OR)

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

22) a) 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.

(OR)

b) Find the values of

(i) $\sin^{-1}\left[\sin\frac{5\pi}{9}\cdot\cos\frac{\pi}{9} + \cos\frac{5\pi}{9}\cdot\sin\frac{\pi}{9}\right]$ (ii) $\cos^{-1}\left[\cos\left(\frac{-\pi}{3}\right)\right]$

23) a) By using Gaussion Elimination method, balance the chemical reaction equation: $C_5H_8+O_2 \rightarrow CO_2+H_2O$

(OR)

b) Solve the equation: $z^3+8i = 0$, where $z \in c$.

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