



Standard 12
MATHEMATICS

Time: 1.30 Hrs.

Marks: 45

Part - A

I. Answer the following questions:

10×1=10

- 1) If $A = \begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, $B = \text{adj } A$ and $C = 3A$ then, $\frac{|\text{adj } B|}{|C|} = \underline{\hspace{2cm}}$.
- 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 $B = \underline{\hspace{2cm}}$.
- 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 $\underline{\hspace{2cm}}$.
- 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 $\underline{\hspace{2cm}}$.
- 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 $\underline{\hspace{2cm}}$.
- 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 $\underline{\hspace{2cm}}$.
- 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 $e 1/\alpha$ 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.

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

13) If $\text{adj } A = \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, 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 $(2 + i\sqrt{3})^{10} - (2 - \sqrt{3})^{10}$ 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 Cr mer'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

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

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 $z \in \mathbb{C}$.

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