



Date: 03-05-2016

Dept. No.

Max. : 100 Marks

Time: 01:00-04:00

PART – A

(10 x 2 = 20)

Answer ALL questions

1. Write the expansion for $\sin n\theta$.
2. If $x = \cos \theta + i \sin \theta$ find $x^n + \frac{1}{x^n}$.
3. Show that $\cosh 2x = \frac{1 + \tanh^2 x}{1 - \tanh^2 x}$.
4. Find the value of $\text{Log}(1 + i)$.
5. Define a Hermitian matrix with one example.
6. Find the eigen values of $\begin{bmatrix} a & h & g \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$.
7. What is the condition that the lines $lx + my + n = 0$ and $l_1x + m_1y + n_1 = 0$ are conjugate with respect to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
8. Define the conjugate diameters of the ellipse.
9. Write the standard form of the equation to the hyperbola and its asymptotes.
10. Write the polar equation to the conic and its directrix.

PART – B

(5x8 = 40)

Answer any FIVE questions

11. Expand $\sin^8 \theta$ in terms of cosines of multiples of θ .
12. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 2x - 2 \sin x}{x^3}$.
13. Separate into real and imaginary parts $\tan^{-1}(x + iy)$.
14. If $\sin(\theta + i\phi) = \tan(x + iy)$, Show that $\frac{\tan \theta}{\tanh \phi} = \frac{\sin 2x}{\sinh 2y}$.
15. Find the characteristic roots of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.
16. Find the locus of the poles of chords of a parabola subtending a right angle at the vertex.
17. Prove that in an ellipse, the tangents at the extremities of a diameter are parallel to the chords bisected by the diameter.
18. Find the asymptotes of the hyperbola $3x^2 - 5xy - 2y^2 + 17x + y + 14 = 0$

Answer Any TWO Questions

19. a. Determine a, b, c such that $\lim_{\theta \rightarrow 0} \frac{\theta(a + b \cos \theta) - c \sin \theta}{\theta^5} = 1$.

b. Expand $\sin^3 \theta \cos^4 \theta$ in terms of sines of multiples of θ . (8 + 12)

20. a. If $\tan(\alpha + i\beta) = x + iy$ prove that $x^2 + y^2 + 2x \cot 2\alpha = 1$.

b. If $\log \sin(\theta + i\phi) = A + iB$, Show that

(i) $2e^{2A} = \cosh 2\phi - \cos 2\theta$ (ii) $\tanh \phi = \tan \theta \cot B$. (8 + 12)

21. Diagonalize the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$.

22. a. A tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose centre is C meets the circle.

$x^2 + y^2 = a^2 + b^2$ at Q and Q'. Prove that CQ and CQ' are conjugate diameters of the ellipse.

b. Trace curve $\frac{12}{r} = 4 + \sqrt{3} \cos \theta + 3 \sin \theta$. (10 + 10)

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