

B.Sc. Semester : II
Marks : 40

Subject : Mathematics
Paper No.: CC-MAT-122

Date : 10 /03 /2017
Time : 1:30 hrs

Section -A

Attempt any five .

(5)

1. $\frac{1}{2i}(z - \bar{z}) = \underline{\hspace{2cm}}$. (A) Re (B) Im (C) $|z|$
2. $\cos x = \underline{\hspace{2cm}}$. (A) $\frac{e^{ix} + e^{-ix}}{2}$ (B) $\frac{e^{ix} - e^{-ix}}{2i}$ (C) $\frac{e^{ix} + e^{-ix}}{2i}$
3. If $z = 2 + \sqrt{3} + i$ then $|z| = \underline{\hspace{2cm}}$.
(A) $\sqrt{2}(\sqrt{3} - 1)$ (B) $\sqrt{2}(\sqrt{3} + 1)$ (C) None of this
4. $\arg(-5) = \underline{\hspace{2cm}}$. (A) $-\frac{\pi}{2}$ (B) 0 (C) π
5. Solution of the equation $yp = p^2x + a$ is $\underline{\hspace{2cm}}$.
(A) $Cy = c^2x + a$ (B) $y = c^2x + \frac{a}{2}$ (C) $y = cx + a$
6. * Solution of the equation $y'' + y' - 6y = 0$ is $\underline{\hspace{2cm}}$.
(A) $Y = c_1e^{2x} + c_2e^{-3x} + c_3x$ (B) $y = c_1e^{2x}$ (C) $y = c_1e^{2x} + c_2e^{-3x}$
7. If A is square matrix then $(\bar{A})^T = \underline{\hspace{2cm}}$.
(A) $-A^*$ (B) A^* (C) None of this.

Section -B

Attempt any five .

(5)

8. Prove that $\arg z + \arg \bar{z} = 2n\pi$, where $n \in \mathbb{Z}$.
9. Write the formula for $\tan n\theta$, where $n \in \mathbb{N}$.
10. Prove that $\cosh^2 x - \sinh^2 x = 1$.
11. Find the value of $\log(-i)$.
12. Write the definition of linear differential equation.
13. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = 0$.
14. Write the definition of symmetric matrix.

Section -C

Attempt any three .

- 15. If $|z| = 1$ and $\arg z = \theta$ then prove that $\frac{1+z}{1-z} = i \cot \frac{\theta}{2}$.
- 16. Prove that $\cos^7 \theta = \frac{1}{64} [\cos 7 \theta + 7 \cos 5 \theta + 21 \cos 3 \theta + 35 \cos \theta]$
- 17. Prove that $i \log \left(\frac{a-ib}{a+ib} \right) = \tan^{-1} \frac{2ab}{a^2-b^2}$.
- 18. Solve : $y'' - 3y' + 2y = e^{7x}$.
- 19. If $\begin{bmatrix} x+y & y-z \\ 5-t & 7+x \end{bmatrix} = \begin{bmatrix} t-x & z-t \\ z-y & x+z+t \end{bmatrix}$ then find the value of x, y, z and t .

Section -D

Attempt any four.

(12)

- 20. Solve the equation $x^7 + x^4 + x^3 + 1 = 0$ using D'Morve's theorem.
- 21. Prove that $(1 + \cos \theta + i \sin \theta)^n + (1 + \cos \theta - i \sin \theta)^n = 2^{n+1} \cos^n \frac{\theta}{2} \cos \left(\frac{n\theta}{2} \right)$.
- 22. If $\cos(\alpha + i\beta) = \gamma \cos \theta$ then prove that $e^{2\beta} = \frac{\sin(\alpha - \theta)}{\sin(\alpha + \theta)}$.
- 23. Solve the equation $\sin y \frac{dy}{dx} = \cos y (1 - x \cos y)$.
- 24. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ then find A^{-1} using by Row Reduced Echelon form.
- 25. Solve $(D^3 - 4D^2 - 3D + 18)y = 4e^x - 5x^2 + x + 2$.

Section -E

Attempt any two .

(12)

- 26. State and prove D'Morve's theorem.
- 27. Prove that (i) $\sin h^{-1}z = \log (z + \sqrt{z^2 + 1})$ and
(ii) $\tan h^{-1} z = \frac{1}{2} \log \left(\frac{1+z}{1-z} \right)$
- 28. Find the formula for $\frac{1}{D^2+a^2} \cos ax$ and $\frac{1}{D^2+a^2} \sin ax$.
- 29. If A is $m \times n$ matrix and B is $n \times p$ matrix then prove that $(AB)^T = B^T A^T$.