LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

SECOND SEMESTER – **APRIL 2023**

MT 2101 – MATHEMATICS FOR COMPUTER APPLICATIONS

Date: 10-05-2023   Dept. No.   Max. : 100 Marks
Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL questions   **(10x2= 20)**

1. Express $\cos \theta$ in terms of ascending powers of θ.

2. Express $\sin n\theta$ in terms of powers sines and cosines of θ.

3. Solve $(D^2 + 5D + 6)y = 0$.

4. Evaluate $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$.

5. Define a scalar matrix with an example.

6. State Cayley Hamilton theorem.

7. Give two examples for a homogeneous function.

8. Find the partial coefficients of $u = \cos(ax + by)$.

9. What is the order of convergence in Newton-Raphson method?

10. What do you mean by interpolation?

PART – B

Answer any FIVE questions   **(5 x 8 = 40)**

11. Express $\frac{\sin 6\theta}{\sin \theta}$ in terms of $\cos \theta$.

12. Using Bernoulli's formula, evaluate $\int x^4 e^{2x} \, dx$.

13. If the roots of the equation $x^3 + px^2 + qx + r = 0$ are in arithmetic progression,
    then prove that $2p^3 - 9pq + 27r = 0$.

14. Find the characteristic equation and the eigen values of the matrix $A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

15. Prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ when $u = \log \frac{x^2 + y^2}{xy}$.

16. Evaluate the partial differential coefficients $\frac{\partial^2 u}{\partial x^2}, \frac{\partial^2 u}{\partial y^2}, \frac{\partial^2 u}{\partial z^2}$ for the function
    $u = \sin(ax + by + cz)$.

17. Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using Trapezoidal rule.

18. Solve $(3D^2 + D - 14)y = 13e^{2x}$.

PART – C

19. Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$ and hence find

    its inverse.

20. Solve the equation $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

21. Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct

    to three decimal places.

22. (a) If $(D^2 - 4D + 3)y = e^{-x}\sin x$.

    (b) $\int \frac{2x+1}{x^2+3x+1} \, dx$. $(10 + 10)$

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