FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2025

(Regular/Improvement/Supplementary)

COMPUTER SCIENCE & MATHEMATICS (DOUBLE MAIN)

GDMA4B07T: DIFFERENTIAL EQUATIONS

Time: 2 Hours   **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 marks)

1. Find a general solution of the ODE $64y'' - 48y' - 7y = 0$ by first converting it to a system.

2. Are the following functions linearly independent sin2x, cosx sinx.

3. Evaluate $(D + 5I)(D - I)(3x^4)$.

4. Define second order Euler-Cauchy differential equation. Write the expression for auxiliary equation.

5. Find a general solution of $y' = 2\sec 2y$.

6. Find the Wronskian of 1, e^x and verify linear independency.

7. Solve $x^2 y'' - 3xy' + 4y = 0$.

8. Verify whether $\cos 2x$ is an integrating factor of $2\cos y\, dx = \sin y\, dy$.

9. Verify whether 1, e^x, e^{-x} are linearly independent or dependent.

10. Express the given system of ODE in matrix form.

$$y_1' = -5y_1 + 2y_2$$

$$y_2' = 13y_1 + \frac{1}{2}y_2$$

11. Write steps to find orthogonal trajectories.

12. Find the Eigen values and Eigen vectors of the matrix.

$$\begin{bmatrix} -4.0 & 4.0 \\ -1.6 & 1.2 \end{bmatrix}$$

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 marks)

13. Solve the Euler –Cauchy equation $y''' - y'' - 4y' + 4y = 0$.

14. Solve $y' = (y + 9x)^2$.

15. Factorize and solve $(D^2 - D - 2)y = 0$.

16. Find general solution of $10\ x^2 y'' + 46xy' + 32.4y = 0$.

17. Test exactness and solve $-\pi sin\pi x \sinh y\ dx + cos\pi x \cosh y\ dy = 0$.

18. Solve the initial value problem $x^2 y' + 3xy = \frac{1}{x}, y(1) = -1$.

19. Solve $x^2 y'' - 3xy' + 4y = 0$.

SECTION C: Answer any *one* question. The question carries *ten* marks.

20. Find a basis for solution of the ordinary differential equation:

   $(x^2 - x)y'' - xy' + y = 0$ using reduction of order method.

21. Solve the ODE $(D^3 - 2D^2 - 9D + 18I)y = e^{2x}$.

(1 x 10 = 20 Marks)