GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR
(GIET UNIVERSITY)
Ph.D. (Second Semester-Summer) Examinations, May – 2025
23SPPEMT2013 – Advanced Differential Equations
(Mathematics)

Time: 3 hrs   Maximum: 70 Marks

The figures in the right hand margin indicate marks.

	Answer *ANY FIVE* Questions.	**(14 x 5 = 70 Marks)**	**Marks**

1. a. Find the general solution of the following differential equation $x^2 y'' + 2xy' - 12y = 0$, $x > 0.$.   **8**

   b. Solve $(1 + x)\frac{dy}{dx} - xy = (1 - x)$.   **6**

2. a. Solve $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$. Find $y(0.2)$, where $h = 0.1$ using Range-Kutta Method of 4th order form.   **10**

   b. Explain relationship between consistency, stability and convergence.   **4**

3. a. Form a PDE by eliminating the function from the following equation   **6**

$$z = f(x + at) + g(x - at).$$

   b. Solving by Charpit's Method; $2zx - px^2 - 2qxy + pq = 0$.   **8**

4. Using Milne's Predictor Corrector Method, find y when x=0.8. Given $\frac{dy}{dx} = x - y^2, y(0) = 0, y(0.2) = 0.002, y(0.4) = 0.0795, y(0.6) = 0.1762$.   **14**

5. Given $\frac{dy}{dx} = x^2(1 + y)$ by Adams Bashforth Method $y(1) = 1,\ y(1.1) = 1.233,\ y(1.2) = 1.548,\ Y(1.3) = 1.97$. find $y(1.4)$.   **14**

6. a. Give a comparison between Euler Method and Modified Euler Method.   **4**

   b. Find the value of y at $x = 0.4$ of the following equation in Modified Euler Method   **10**

$$\frac{dy}{dx} = x^2 + y, \qquad y(0) = 1, \text{and } h = 0.1$$

7. Derivation of equation of motion in a cylindrical Coordinate system.   **14**

8. Derive the Rayleigh wave propagation in a two layered medium discussed by Rayleigh.   **14**

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