

Roll No. ....

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**1032/MJ**

**F-10/2051**

**ORDINARY DIFFERENTIAL EQUATIONS**

Paper-202

Semester-II

Time allowed : 3 Hours] [Maximum Marks : 70

**Note:** The candidates are required to attempt two questions each from section A and section B carrying 10 marks each and the entire section C consisting of 10 questions carrying 3 marks each.

**SECTION-A**

1. Solve  $(1 + e^{x/y})dx + e^{x/y} \left(1 - \frac{x}{y}\right)dy = 0$

2. Solve the differential equation :

$$(xy^2 - e^{x^{\frac{1}{3}}}) dx - x^2y dy = 0.$$

3. Solve  $(px - y)(py + x) = a^2p$ ; where  $p = dy/dx$ .
4. Using Picard's method of successive approximation, obtain a solution upto fifth approximation of the equation  $\frac{dy}{dx} = y + x$ , such that  $y(0) = 1$ .

**SECTION-B**

5. Solve :

$$\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y = \text{cose}^{-x}$$

6. Apply the method of variation of parameters to solve :

$$\frac{d^2y}{dx^2} - 5 \frac{dy}{dx} + 6y = 2e^x.$$

7. Solve the following Cauchy-Euler equation :

$$x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 3y = x^2.$$

8. Solve in series the equation :

$$\frac{d^2y}{dx^2} + xy = 0$$

### SECTION-C

9. Write in brief:

(i) Find the order and degree of the equation :

$$y = px + \sqrt{a^2 p^2 + b^2} \quad \text{where } p = \frac{dy}{dx} .$$

State also if this is linear or non-linear.

(ii) Define exact differential equation.

(iii) What is the difference between ordinary and regular points. Also give an example of a regular point.

(iv) Write the general solution of the differential equation  $y'' = 0$ .

(v) State the Legendre's equation with  $n = 0$ .

(vi) Find the value of  $n$  for which the equation  $(xy^2 + nx^2y)dx + (x^3 + x^2y)dy = 0$  is exact.

(vii) Define Homogenous and Non-homogenous differential equation of order  $n$  with constant coefficients.

(viii) State the existence and uniqueness theorem of solution of first order differential equation.

(ix) State Clairaut's equation.

(x) Find the solution of  $\frac{dy}{dx} + y = 1$  .