

Roll No.: .....

# National Institute of Technology, Delhi

Name of the Examination: B. Tech. Mid Semester Examination October 2022

Branch : EEE

Semester : 3rd

Title of the Course : Ordinary Differential

Course Code : MAL 201

Equations and Transforms

Time: One and Half Hours

Maximum Marks: 25

Note : All sections are compulsory.

## Section A (15 Marks)

Section A contains 5 questions (Question number 1 to 5) of 03 Marks each.

Q.1. Solve the differential equation  $x^4 \frac{dy}{dx} + x^3 y + \operatorname{cosec}(xy) = 0$

Q.2. Solve the differential equation  $D^2 y - y = x \sin x + e^x(1 + x^2)$

Q.3. Solve the differential equation  $\left(\frac{dy}{dx}\right)^3 + 2x\left(\frac{dy}{dx}\right)^2 - y^2\left(\frac{dy}{dx}\right) - 2xy^2 \frac{dy}{dx} = 0$

Q.4. Use method of undetermined coefficients to find a solution to the differential equation

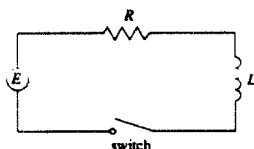
$$\frac{d^2 y}{dx^2} - 3 \frac{dy}{dx} + 2y = x^2 + e^x$$

Q.5. Find complete solution of  $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = \log x \sin(\log x)$

## Section B (10 Marks)

Section B contains 2 questions (Question number 6 to 7) of 05 Marks each.

Q.6. In the circuit shown in figure below, a battery supplies a constant voltage of 40 V, the inductance is 2 H, the resistance is  $10 \Omega$ , and  $I(0) = 0$ . Find  $I(t)$  and the current after 0.1 sec.



Q.7. Find the series solution for the differential equation  $x(1-x) \frac{d^2 y}{dx^2} + (1-x) \frac{dy}{dx} - y = 0$  about the singular point  $x = 0$ .