Roll No.....

National Institute of Technology Delhi

Name of the Examination: B.Tech.

Mid Sem Exam (2018-19)

Branch: EEE **Semester-III**

Course Title: Ordinary Differential Equations & Transforms **Course Code: MAL 201**

Max Time: 2 hrs **Total Marks: 25**

Note: All questions are compulsory

---

1. (a) State and Prove the necessary and sufficient condition for the first order differential equation to be exact. [4 Marks]

   (b) Solve the IVP

$$(e^{(x+y)} + ye^y)dx + (xe^y - 1)dy = 0, \quad y(0) = -1.$$

   [3 Marks]

2. Find a 6th order homogeneous linear equation whose general solution is

$$y = c_1 + c_2t + c_3e^{-2t}\cos t + c_4e^{-2t}\sin t + c_5te^{-2t}\cos t + c_6te^{-2t}\sin t.$$

   [2 Marks]

3. Solve, by the method of variation of parameters, $y'' - 2y' + y = e^x \log x$. [3 Marks]

4. Find the series solution of the differential equation

$$(1 - x^2)y'' - y' + 4y = 0.$$

   [4 Marks]

5. (a) Solve the Euler-Cauchy equation $x^2y'' - 6xy' + 9y = 0$.

   (b) Solve the IVP $2x^2y'' + 3xy' - 15y = 0, \quad y(1) = 0, y'(1) = 0.$ [2+2 Marks]

6. Find the orthogonal trajectories to the family of confocal and coaxial parabolas.

$$r = \frac{2a}{1 + \cos\theta}$$

   [3 Marks]

7. Solve $(D - 2)^2y = 8(e^{2x} + \sin 2x + x^2)$. [2 Marks]