KALING INSTITUTE OF INDUSTRIAL TECHNOLOGY
DEEMED TO BE UNIVERSITY
Autumn Mid Semester Examination-2018
SUB: MATH-I (MA-1003)

Time: 1 Hour 30 Minutes **Full Marks: 20**

Answer any FIVE questions including question No.1

Q.1 Answer all the following questions. (1x4)

a) Calculate $(D-4I)(D+3I)\sinh 2x$.

b) Find theWronskian and show the linearly independence of following functions $2x, \frac{1}{4x}$.

c) Find an ODE for which the following functions form a basis of solutions $x^2, x^2 \ln x$.

d) What do you mean by superposition principle? Which differential equation it is applicable to?

Q.2 (a) Find a general solution. [2]

$$xy' = y + 2x^3 \sin^2\left(\frac{y}{x}\right).$$

(b) Find an Integrating Factor and solve [2]

$$\left(3xe^y + 2y\right)dx + \left(x^2e^y + x\right)dy = 0.$$

Q.3 (a) Solve the Bernoulli equation [2]

$$y' + \frac{y}{2} = y^3.$$

(b) Reduce the following ODE to first order and solve [2]

$$y'' + \left(1 + \frac{1}{y}\right)(y')^2 = 0.$$

Q.4 A tank contains 1000 gallons of water in which 100 lb of salt is dissolved. Brines runs in a rate of 10 gal/min and each gallon contains 5 lb of dissolved salt. The mixture in the tank kept uniform by stirring. Brine runs out at 10gal/min. Find the amount of salt in the tank at any time t. [4]

Q.5 Solve the Initial Value Problem [4]

$$y'' + 4y = -12\sin 2x, \quad y(0) = 1.8, \quad y'(0) = 5$$

Q.6 Find a general solution by variation of parameters [4]

$$xy'' - y' = (3+x)x^2e^x$$