KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY
DEEMED TO BE UNIVERSITY
Autumn Mid Semester Examination-2019
SUB: MATH-I (MA-1003)

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

Answer any FOUR questions including question No.1

Q.1 Answer the following. [1 × 5]

a) Solve $y' = e^{2x-1}y^2$.

b) Find an integrating factor of the ODE

$$(1 + 2x)\cos y\, dx + \frac{1}{\cos y} dy = 0.$$

c) Apply the Picard's iteration method to $y' = 2y^2, y(0) = 1$ to obtain the 1st approximate solution.

d) Find a second order ODE for the given basis

$$\cosh 1.8x, \sinh 1.8x$$

e) Using Wronskian, verify the following functions for linearly independent or dependent on the positive x-axis?

$$e^{-x}\cos 2x, e^{-x}\sin 2x.$$

Q.2 A rocket is shot straight up from the earth, with a net acceleration (acceleration by the rocket engine minus gravitational pullback) of $7t$ m/sec^2 during the initial stage of flight until the engine cut out at $t = 10$ sec. How high will it go, if the air resistance is neglected? [5]

Q.3 (a) Solve $y' + y = -\frac{x}{y}$. [2]

(b) Solve $x^3y' + 2x^2\tan y = e^x \sec y$. [3]

Q.4 Solve the initial value problem $x^2y'' + xy' - y = 16x^3$, given that $y(1) = -1$ and $y'(1) = 1$. [5]

Q.5 (a) Find the basis of solution of the following ODE if one of its solution is $y_1 = \frac{\sin x}{x}$ [2]

$$xy'' + 2y' + xy = 0.$$

(b) Find the general solution of the differential equation $y'' + y' = 2$ using the method of undetermined coefficient. [3]

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