North South University

Mat-350, Sec-07+08+16, Fall-2021

Mid Term Exam. Total Marks-25, Time-01 Hour

[Submission Time-15 mins as student id#.pdf]

There are Six Questions. Please answer ALL of them
Please show all necessary works…

[Where $k \neq 0$ is the 6th digit of your student Id# . If $k = 0$ then choose $k = 2$]

Q1. What is differential equation? Consider

$$k\frac{dy}{dx} = -\frac{kx}{y}.$$

Draw the direction field in a graph paper. Then, sketch, by hand, an approximate solution curves. Hence solve it.

Q2. What is the condition for a differential equation to be exact? Determine whether the given differential equation is exact or not. Justify your answer. If not exact, make it exact.

$$k(2\tan x - 2\sin x \sin y)dx = 2k\cos x \cos y\, dy$$

Q3. What is Bernoulli's equation? Is this differential equation

$$y^{\frac{5}{2}}\frac{dy}{dx} + y^{\frac{7}{2}} = ky^2, \;\; y(0) = 4$$

Bernoulli's equation? Justify your answer. Is it linear equation? If not, make it linear.

Q4. What is Cauchy-Euler Equation. Is

$$x^3y'' + x^2y' + xy = k\ln x^2$$

it Cauchy-Euler Equation? Justify your answer.

Q5. Solve $x^2y'' + xy' + y = 0$.

Q6. Convert the following differential equation into constant coefficients

$$x^2y'' + xy' + y = k\ln x^2\ .$$

Hence solve it.