North South University

Mat-350, Sec-7,8&16, Fall-2021

Make up Mid Term-Traditional, Total Marks-20, Time-01 hour

There are Five Questions. Please answer any FOUR.

Q1. What is the condition for a differential equation to be exact? Determine whether the given differential equation is exact. If it is exact, solve it.

$$\left(2y\sin x\cos x - y + 2y^2e^{xy^2}\right)dx - \left(x - \sin^2 x - 4xye^{xy^2}\right)dy = 0.$$

Q2. What is Bernoulli's equation? Solve the following Bernoulli's equation:

$$x^2y^{\frac{3}{2}}\frac{dy}{dx} - 2xy^{\frac{5}{2}} = 3y^{\frac{11}{2}},\ \ y(1) = \frac{1}{2}$$

Q3. Solve the following differential equation by using variation of parameters

$$y'' - 4y' + 4y = (12x^2 - 6x)\,e^{2x}$$

Q4. Discuss about the Cauchy-Euler Equation. Solve the following differential equation by converting it to constant coefficients:

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

Q5. For a spring-mass model, interpret and solve the following initial value problem

$$0.5x'' + 2.5x' + 5x = 3\cos 2t\,,$$
$$\text{with}\quad x(0) = 1, x'(0) = -1.$$