

University of Ruhuna



Faculty of Science

December 2020

BSc/BCS General Degree Level I (Semester I) Examination

Subject: Mathematics

Course Unit: MAT112δ Differential Equations

Answer All Questions

Time: One hour

1. Solve the differential Equation $x \frac{dy}{dx} + 2y = x^3 y^2 \sin(x)$.

If $y\left(\frac{\pi}{2}\right) = 1$ find the solution of the above differential equation.

[20 marks]

2. Let $p = \frac{dy}{dx}$. Find the general solution and the singular solution of the differential equation $y = xp - p(\ln p - 1)$.

[20 marks]

3. Consider the differential equation $2xy dx + (y^2 - x^2 - 4)dy = 0$.

a. Check whether the above differential equation is exact or not.

b. Solve the above differential equation using a suitable method.

[25 marks]

4. Let $D = \frac{d}{dt}$ be the differential operator with respect to the independent variable t . Solve the following simultaneous differential equations for $x(t)$ and $y(t)$ using D operators.

$$(D^2 - 3)y - x = -e^{-t} \quad \dots\dots\dots (1)$$

$$Dx + 2y = 0 \quad \dots\dots\dots (2)$$

[35 marks]

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