The Open University of Sri Lanka
B.Sc. /B.Ed. Degree Programme
Applied Mathematics – Level 04
APU2144/APE4144 – Applied Linear Algebra and Differential Equations
No Book Test (NBT) – 2016/2017

DURATION: ONE HOUR.

Date: 29 October, 2017 **Time: 01.00 pm –02.00 pm**

ANSWER ALL QUESTIONS.

1. Solve each of the following systems of differential equations given below.

   (i) $\dot{x}_1 = 3x_1 + x_2 - 2\sin t$
   $\dot{x}_2 = 4x_1 + 3x_2 + 6\cos t$

   (ii) $\ddot{x} = x - 4y$
   $\ddot{y} = -x + y$

2. (i) Find a sinusoidal particular solution for the following system of ~~partial~~ differential equations:

   $\ddot{x}_1 + 2\ddot{x}_2 + \dot{x}_1 + x_1 - 3x_2 = \sin t$
   $3\ddot{x}_1 + \ddot{x}_2 + 2\dot{x}_2 + 2x_1 + x_2 = \cos t - 2\sin t.$

   (ii) Find the general solution of the following differential equation:

   $$x^2\frac{d^2y}{dx^2} - 5x\frac{dy}{dx} + 8y = 2x^3.$$

   (iii) Find the general solution of the pair of simultaneous partial differential equations

   (a) $\dfrac{\partial u}{\partial x} = 2x + e^{x-y}, \quad \dfrac{\partial u}{\partial y} = 2y - e^{x-y}.$

   (b) $\dfrac{\partial u}{\partial x} = 3x^2e^y, \quad \dfrac{\partial u}{\partial y} = e^y(x^3 + y^3) + 3y^2e^y.$