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) – 2015/2016

DURATION: ONE HOUR.

Date: 05 November, 2016 **Time: 01.00 pm –02.00 pm**

ANSWER ALL QUESTIONS.

1. (a) Find the general solution of the system of simultaneous differential equations, given below:

$$\dot{x}_1 = 7x_1 - x_2 + 6x_3$$
$$\dot{x}_2 = -10x_1 + 4x_2 - 12x_3$$
$$\dot{x}_3 = -2x_1 + x_2 - x_3.$$

(b) Solve the following system of differential equations given below :

$$\dot{x}_1 = x_1 + 2x_2 + 6e^t$$
$$\dot{x}_2 = 3x_1 + 2x_2 - 6e^{2t}.$$

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

$$\ddot{x}_1 + 4x_1 + 2x_2 = 6\cos 2t$$
$$\ddot{x}_2 + x_1 + 9x_2 = 2\sin 2t.$$

(b) Find the general solution of each of the following simultaneous partial differential equations:

(i) $\frac{\partial u}{\partial x} = 3x^2, \quad \frac{\partial u}{\partial y} = 8y.$

(ii) $\frac{\partial u}{\partial x} = 3x^2 y - a\sin ax, \quad \frac{\partial u}{\partial y} = x^3 - e^{-y}.$

(c) Find the general solution of the differential equation given below:

$$x^2 \frac{d^2 y}{dx^2} - 4x\frac{dy}{dx} + 6y = 4x - 6.$$