THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. /B.Ed. DEGREE PROGRAMME
LEVEL 04-APPLIED MATHEMATICS
CLOSED BOOK TEST-2010/2011
APU 2144–Applied Linear Algebra and Differential Equations

DURATION: ONE AND HALF (1 ½) HOURS

Date: 28 April 2011. **Time: 4.00 pm –5.30 pm**

ANSWER ALL QUESTIONS.

1. Find the general solution of each of the systems of simultaneous equations given below:

(i) $\dot{x}_1 = x_1 + x_2$
$\dot{x}_2 = 3x_1 - x_2$

(ii) $\dot{x}_1 = 5x_1 + 3x_3$
$\dot{x}_2 = 3x_1 + 2x_2 + 3x_3$
$\dot{x}_3 = 6x_1 - 4x_3$

2. Find all the eigenvalues and eigenfunctions for the following boundary value problem:

$y'' + \lambda y = 0, \quad y(0) = 0, \quad y(1) = 0.$

3. (a) Find the general solution of each of the following partial differential equations:

(i) $\frac{1}{3}\frac{\partial u}{\partial x} + \frac{x^2}{x^3+1}u = \frac{e^x}{3}$

(ii) $y\frac{\partial u}{\partial y} + 2xy^2u = y^2$

(b) Find the general solution of the pair of partial differential equations:

$\frac{\partial u}{\partial y} = 4y^3e^x$

$\frac{\partial u}{\partial x} = e^x(x^4 + 4x^3 + y^4).$