Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
200 Level 1st Semester Examination – Jul./Aug. 2016
SCT 201-2 Mathematics II

Uva Wellassa University

Instructions to candidates
Duration: Two(02) hours
Number of questions: Four(04) Essay Questions
Mark allocation: 100 mark
Use standard symbols without definition.
Scientific calculators are allowed.
Answer all questions

1.

a. Let $A = \begin{pmatrix} 3 & 2 \\ 1 & -6 \end{pmatrix}$, $B = \begin{pmatrix} 5 & 3 \\ 2 & -1 \end{pmatrix}$ and $C = (1 \quad -2 \quad -3)$, find;

i. $3A + 2B$ (04 mark)
ii. C^T (03 mark)
iii. determinant of matrix A (03 mark)
iv. inverse of matrix B (04 mark)

b. If $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} x & 2 \\ 7 & y \end{pmatrix} = \begin{pmatrix} 25 & b \\ a & 13 \end{pmatrix}$, find the values of x, y, a and b. (06 mark)

c. Use **Gauss-Jordan method** to solve the following system of linear equations.

$$x + 3y - 4z = 9$$
$$2x - y + z = 3$$
$$x + 2y - 5z = 16$$

(10 mark)

2. A firm makes two types of containers, A and B. Each of which requires cutting, assembling and finishing. The maximum available machine capacity in hours per week for each process is: cutting 50, assembly 84 and finishing 72.
The process times for one unit of each type are as follows:

Process	Time in hours	
	A	B
Cutting	2	5
Assembly	4	8
Finishing	4	5

The profit margin is Rs. 600 per unit A and Rs. 1000 per unit B:

a. Formulate the mathematical model to find the maximum profit of product mix. (05 mark)

b. Determine the optimum weekly output of containers and maximum profit using **graphical method**. (10 mark)

3.

a. Find the general solution of the equation $\frac{dy}{dx} = 3x^2 - 4x + 5$. (05 mark)

b. Solve $x\frac{dy}{dx} = y + xy$, by separating the variables. (08 mark)

c. Solve the following differential equations by using integrating factor.

i. $x\frac{dy}{dx} + y = x^3$ (07 mark)

ii. $\frac{dy}{dx} + \cot xy = \cos x$ (10 mark)

4. Solve the following ordinary differential equations (ODEs).

a. $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 0$ (04 mark)

b. $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$ (06 mark)

c. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 10y = 0$ (07 mark)

d. $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 24$ (08 mark)