

Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Science and Technology Degree Programme
2nd year 1st Semester Examination – August / September 2014
SCT 201-2 Mathematics II



Use standard symbols without definition.

Scientific calculators are allowed.

Number of questions: 04

Answer all questions

Time allocation: Two (02) hours

Mark allocation: 100 marks

- 1.
- a. Clearly state all the elementary row operations. (5 mark)
- b. Use matrix row operations to solve following problem.

Three shopkeepers A, B and C go to a store to buy stationery. A purchases 12 dozen notebooks, 5 dozen pens and 6 dozen pencils, B purchases 10 dozen notebooks, 6 dozen pens and 7 dozen pencils, C purchases 11 dozen notebooks, 13 dozen pens and 8 dozen pencils. The individual bills of A, B and C are Rs. 1536, Rs. 1416 and Rs. 1872 respectively. Find the cost of a notebook, a pen and a pencil.

(20 mark)

- 2.
- a. What is meant by linear programming? (5 mark)
- b. A furniture firm manufactures chairs and tables, each requiring the use of three machines A, B and C. Production of one chair requires 2 hours on machine A, 1 hour on machine B and 1 hour on machine C. Each table requires 1 hour each on machine A and B and 3 hours on machine C. The profit obtained by selling one chair is Rs. 30 while by selling one table the profit is Rs. 60. The total time available per week on machine A is 70 hours, on machine B is 40 hours, and on machine C is 90 hours. How many chairs and tables should be made per week so as to maximize profit? Formulate the problem as a linear programming problem and solve it graphically. (20 mark)

3.

- a. What is meant by homogeneous equation? (5 mark)
- b. Verify that $y = 4x^3 - 5x^2$ is a solution to the differential equation $y' - \frac{2}{x}y = 4x^2$. (10 mark)
- c. Show that $y(t) = C_1e^{2t} + C_2e^{-2t}$ is a solution of the differential equation $y'' - 4y = 0$, where C_1 and C_2 are arbitrary constants. Find the solution satisfying $y(0) = 2$ and $y'(0) = 0$. (15 mark)

4.

- a. Two farmers Nimal and Kamal cultivate wheat, vegetables and fruits. The sale of these commodities by both farmers in the month of April and May are given below by the matrices A and B.

Sale (in rupees) in the month of April:

$$A = \begin{array}{ccc|c} \text{Wheat} & \text{Vegetables} & \text{Fruits} & \\ \hline 8,000 & 12,000 & 10,000 & \text{Nimal} \\ 12,000 & 21,000 & 9,000 & \text{Kamal} \end{array}$$

Sale (in rupees) in the month of May:

$$B = \begin{array}{ccc|c} \text{Wheat} & \text{Vegetables} & \text{Fruits} & \\ \hline 12,000 & 16,000 & 15,000 & \text{Nimal} \\ 16,000 & 24,000 & 10,000 & \text{Kamal} \end{array}$$

- i. Find the total sales in April and May for each farmer in each commodity.
- ii. Find the increase in sales from April to May.
- iii. If both farmers received 10% profit on gross sale, compute the profit for each farmer and for each commodity sold in May.

(10 mark)

b. Solve the following linear programming problem graphically.

$$\text{Min } z = 3x + 4y$$

subject to

$$-2x + y \leq 4$$

$$x + y \geq 3$$

$$x - 2y \leq 2$$

$$x \geq 0, y \geq 0$$

(10 mark)

