



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree in Information and Communication Technology
First Year - Semester II Examination – February/March 2019**

ICT 1404 – MATHEMATICS AND STATISTICS FOR COMPUTING

Time: Three (3) hours

INSTRUCTIONS TO CANDIDATES

1. This paper contains 3 questions on 5 pages (including the cover page).
2. The total marks obtainable for this examination is 100. The marks assigned for each question & sections thereof are included in brackets.
3. This examination accounts for 70% of the module assessment.
4. This is a closed-book examination.
5. Answer **ALL** questions.
6. Start to answer a new question on a new page.
7. **All the necessary steps** for the answers should be **clearly indicated**.
8. Rough work sheets may be attached separately.
9. Calculators are **ALLOWED**.

1

Question 01

(35 marks)

- (a) The numbers x, y, z satisfy the following three equations:

$$40 - x + y + 2z = x + 2y + 7z - 20$$

$$20 + x - y + z = 3x + 2y - 120$$

$$250 + x + y - z = x + 2y - 30$$

Using concepts in matrices, find x, y and z .

(20 marks)

- (b) Using a matrix method, find all the solutions to the following system of linear equations:

$$2x_1 - x_2 + x_3 = 4$$

$$x_1 - 3x_2 + 2x_3 = 4$$

$$3x_1 + x_2 = 4$$

(15 marks)

2

Question 02

(25 marks)

- (a) Find the inverse of the matrix

$$\begin{pmatrix} 1 & 1 & 2 \\ -1 & 1 & -2 \\ 1 & 1 & -1 \end{pmatrix}$$

(08 marks)

- (b) Using matrix methods, find the values of the numbers a and b if the following system of linear equations has infinitely many solutions. Find also, when a and b take these values, all the solutions of the system.

$$x + y + z + w = 4$$

$$x + 3y - z + 5w = 8$$

$$2x - y + 3z - w = 3$$

$$2x - 3y + az - 5w = b$$

(09 marks)

- (c) Use Cramer's rule to solve the following system of linear equations:

$$-x + 2y = 1$$

$$3x - y + 2z = 0$$

$$2x + y - z = 1$$

(08 marks)

3 Question 03

(40 marks)

- (a) A coffee machine may be defective because it dispenses the wrong amount of coffee (C) and / or it dispenses the wrong amount of sugar (G).

The probabilities of these defects are: $P(C) = 0.05$,

$$P(G) = 0.04,$$

$$P(C \text{ and } G) = 0.01$$

What proportions of cups of coffee have:

- i. At least one defect
- ii. No defects

(05 marks)

- (b) Three Machines M_1, M_2 and M_3 produce 50%, 30% and 20% respectively of the total number of items in a factory. The percentages of defective items produced by these three machines are 2%, 4% and 6% respectively. An item is selected at random from the production at the factory.

Let M_1, M_2 and M_3 represent the events that an item chosen at random was produced by machine M_1, M_2 or M_3 respectively and let D represent the event that the selected item is defective.

- i. Draw an appropriate tree diagram to illustrate the events M_1, M_2, M_3 and D . Include the 'outcome' column and the 'probability' column in your tree diagram.

(07 marks)

ii.

1. Find the probability that a randomly selected item is produced by machine M_1 and is defective.

(02 marks)

2. Find the probability that a randomly selected item is produced by machine M_2 and is defective.

(02 marks)

3. Find the probability that a randomly selected item is produced by machine M_3 and is defective.

(02 marks)

- iii. Find the probability that a randomly selected item is defective.

(02 marks)

- iv. Sketch a Venn diagram to illustrate the events M_1, M_2, M_3 and D . Include in your diagram the probabilities corresponding to the different regions within the diagram.

(03 marks)

v. Based on the above Tree diagram, Venn diagram or otherwise answer the following questions:

- (1) Given that a randomly selected item is defective, find the probability that it was produced by machine M_1 .
- (2) Given that a randomly selected item is defective, find the probability that it was produced by machine M_2 .
- (3) Given that a randomly selected item is defective, find the probability that it was produced by machine M_3 .
- (4) Given that a randomly selected item is not defective, find the probability that it was produced by machine M_1 .
- (5) Given that a randomly selected item is not defective, find the probability that it was produced by machine M_2 .
- (6) Given that a randomly selected item is not defective, find the probability that it was produced by machine M_3 .

(06 marks)

vi. Given that a randomly selected item is not defective, find the probability that it was produced by either machine M_1 or machine M_2 .

(02 marks)

(c) A game is played with four fair dice. Each die is rolled once and the number of sixes is noted.

Find the probability that:

- i. There is just one six,
- ii. There are only two sixes,
- iii. There are exactly two sixes given that there were no sixes in the first two rolls.

(09 marks)

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