



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

**(A Constituent College of JKUAT)**

(A Centre of Excellence)

# **Faculty of Engineering & Technology**

**DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY**

**DIPLOMA IN INFORMATION & COMMUNICATION TECHNOLOGY  
(DIT2K 10J)**

**ECS 2311: QUANTITATIVE TECHNIQUE IV**

**SPECIAL/SUPPLEMENTARY EXAMINATION**

**SERIES: OCTOBER 2012**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions

Answer question **ONE** and any other **TWO** questions  
 Maximum marks for each part of a question are as shown  
 This paper consists of **FOUR** printed pages

**SECTION A (COMPULSORY)**

**Question One (20 marks)**

- a) Explain the **TWO** objectives of linear programming. **(2 marks)**
- b) Explain the component of a linear programming model. **(4 marks)**
- c) Outline the procedure to be followed in hypothesis testing. **(4 marks)**
- d) Explain the following terms as used in hypothesis testing.
  - i) Significance level
  - ii) One-sided test. **(4 marks)**
- e) Bofulo Company Ltd claims that the average weight of its loaves of bread is at least 600g. A sample of 40 loaves of bread from the company produced a mean of 595g with a standard deviation of 5g. Using a significance level of 1%, test whether the company's claim is true. **(4 marks)**
- f) Define the term zero lead time as used in inventory control. **(2 marks)**

**SECTION B (Answer Any Two Questions)**

**Question Two (20 marks)**

- a) State and explain **TWO** types of simulation. **(4 marks)**
- b) Mafuta Company Ltd produces and sells a designer perfume called Smartman. The daily demand for the product is 300 units. To produce the product, the company uses two ingredients of raw materials, K1 and K2 whose daily usage is 250 units and 360 units respectively.
- c) The tables below shows the probabilities for the random variables, selling price, cost of K1 and K2 respectively for the production. Use them to answer the questions that follow.

| Selling Price (Per Bottle) Ksh. | Probability |
|---------------------------------|-------------|
| 4000                            | 0.15        |
| 4500                            | 0.35        |
| 5000                            | 0.20        |
| 5500                            | 0.30        |

| Cost of Raw Material K <sub>1</sub> (Ksh) | Probability |
|---|-------------|
| 1000                                      | 0.10        |
| 1500                                      | 0.05        |
| 2000                                      | 0.35        |
| 2500                                      | 0.50        |

| Cost of Raw Material K <sub>2</sub> (Ksh) | Probability |
|---|-------------|
| 1500                                      | 0.20        |
| 2000                                      | 0.25        |
| 2500                                      | 0.15        |

|      |      |
|------|------|
| 3000 | 0.40 |
|------|------|

i) Generate range of random numbers for each of the following:

- I. Selling price
- II. Cost of K<sub>1</sub>
- III. Cost of K<sub>2</sub>

**(6 marks)**

ii) Using the information in the following table, simulate the company's profit for 5 days.

| Variables      | Random Numbers     |
|----------------|--------------------|
| Selling Price  | 58, 30, 46, 27, 99 |
| K <sub>1</sub> | 71, 24, 23, 85, 24 |
| K <sub>2</sub> | 96, 18, 34, 13, 44 |

**Question Three (20 marks)**

a) Define the following:

- i) Test statistic
- ii) Type 1 error

**(4 marks)**

b) Machine A produced 50 diskettes of mean mass 55.2g with standard deviation 2.5g. Machine B produced 40 diskettes of mean mass 55.4g with standard deviation 2g. At 5% level of significance, test whether there is a difference between the two machines.

**(6 marks)**

c) A manufacturer of tooth picks advertised that his packets contained an average of 48 tooth picks per packet. You randomly sampled 10 of his packets and found the following results.

42 41    52    47    43    50    45    46    51    47

$$\alpha = 5\%$$

Would you be justified in complaining at

(10 marks)

**Question Four (20 marks)**

a) Define the term linear programming.

**(2 marks)**

b) Explain **TWO** limitations of linear programming.

**(2 marks)**

c) Explain the main weakness of the graphical method in solving linear programming problems.

**(2 marks)**

d) A firm produces three products X, Y and Z with a contribution of Ksh. 20, 18 and 16 respectively production data are as follows:

e)

|              | Machine Hours | Labour Hours | Materials |
|--------------|---------------|--------------|-----------|
| X            | 5             | 2            | 8         |
| Y            | 3             | 5            | 10        |
| Z            | 6             | 3            | 3         |
| Availability | 3000          | 2500         | 10,000    |

i) Set up the initial tableau including the slack variables.

ii) Use the simplex method to get the optimal solution in maximizing profits contribution

**Question Five (20 marks)**

a) Define the following terms as used in inventory control systems.

- (i) Inventory
- (ii) Stock Holding Cost
- (iii) Ordering Cost

**(6 marks)**

b) Patco Company purchases components used in the manufacture of computer from a supplier. The Company's generator production operation which is operated at a constant rate, requires 10,000 components per month, throughout the year ordering cost are shs. 1000 per order, unit cost is shs 120 per component and annual inventory holding costs are charged at 20%. The annual demand is 500,000 components.

- i) Calculate the economic batch quantity for this component
- ii) Calculate the annual inventory holding and ordering costs associated with the recommended EOQ  
(Assume 365 days in a year)

**(14 marks)**