



# KENYATTA UNIVERSITY

## UNIVERSITY EXAMINATIONS 2017/2018

### FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

#### BMS 102: MANAGEMENT MATHEMATICS

DATE: Friday 24<sup>th</sup> November 2017

TIME: 8.00a.m -10.00a.m

**INSTRUCTIONS:** Answer question 1 and any other two questions.

#### QUESTION ONE ( 30 Marks)

- a) Define the following:
- i. A steady state (2 marks)
  - ii. Stochastic process (2 Marks)
  - iii. Mutually exclusive events (2Marks)
- b) If the probability that a student A will fail a maths exam is 0.3 and the probability that student B will fail the same exam is 0.15 and that the probability that both student A and B will fail the maths exam is 0.08. What is the probability that
- a) At least one of these students will fail the exam ( 3 marks)
  - b) Neither student A nor student B will fail the exam (3 Marks)
- c) Outline the assumptions of the EOQ model (5 Marks)
- d) An economy consists of three industries X, Y and Z and each produces one product. The interaction of the use of X, Y and Z production over some fixed period of time is as shown below:

|   | X   | Y  | Z  | Final demand | Total production |
|---|-----|----|----|--------------|------------------|
| X | 100 | 40 | 80 | 140          | 360              |
| Y | 40  | 60 | 40 | 180          | 320              |
| Z | 60  | 40 | 40 | 100          | 240              |

Suppose demand is expected to increase by 30% for X and Y and reduce by the same percentage for Z industries. What must the total output be to meet this projected demand? (9 Marks)

- e) Highlight the assumptions of Markov analysis (4 Marks)

**QUESTION TWO (20 Marks)**

- a) Explain four reasons for holding stock despite it being an expensive affair (8Marks)
- b) ABC departmental store sells 25,000 type A shirts a year. The supplier offers a generous quantity discount. The price list is given below: -

| Quantity      | Price per shirt (\$) |
|---------------|----------------------|
| 0 –999        | 2.50                 |
| 1,000 – 1749  | 2.00                 |
| 1750 – 2, 499 | 1.50                 |
| Over 2,500    | 1.00                 |

Given that order cost is \$ 20. Inventory carrying cost is 20% of the value of the item. Determine the best inventory policy for ABC. (12 Marks)

**QUESTION THREE (20 Marks)**

- a) State four assumptions of input-output model (4 Marks)
- b) A continental corporation operates a large fleet of cars for which an extensive preventive maintenance program is utilized. The cars can be classified in one of the three states: Good (G), Fair (F) and Poor (P). The transition matrix of these cars is as follows

|   | G   | F   | P   |
|---|-----|-----|-----|
| G | 0.6 | 0.3 | 0.1 |
| F | 0.2 | 0.6 | 0.2 |
| P | 0.1 | 0.4 | 0.5 |

Assume that there are 100 cars in good shape, 60 in fair shape and 20 in poor shape.

- How many cars will be found in each condition next week? ( 2 Marks)
  - How many cars will be found in each condition once the process stabilizes?(4 Marks)
- c) The table below illustrates the 12 possible payoffs in the record and tape companies.

**Table 1:**

|                             |          | Decision Maker's Alternatives |          |             |
|-----------------------------|----------|-------------------------------|----------|-------------|
|                             |          | Expand                        | Build    | Subcontract |
| State of nature<br>(Demand) | High     | 500,000                       | 700,000  | 300,000     |
|                             | Moderate | 250,000                       | 300,000  | 150,000     |
|                             | Low      | -250,000                      | -400,000 | -10,000     |
|                             | Failure  | -450,000                      | -800,000 | -100,000    |

Identify the optimal decision using:-

- Maximax Criterion ( 2Marks)
- Maximin Criterion ( 2 Marks)
- Minimax Regret Criterion (3marks)
- The Criterion of Realism (Hurwicz's rule) using  $\alpha = 0.7$  (3Marks)

#### **QUESTION FOUR (20 Marks)**

- a) Briefly explain the advantages of linear programming (5 Marks)
- b) A firm makes two products X and Y and has a total production capacity of nine tonnes per day, X and Y requiring the same production capacity. The firm has a permanent contract to supply at least two tonnes of X and at least three tonnes of Y per day to another company. Each tonne of X requires twenty machine hours production time and each tonne of Y requires fifty machine hours production time. The daily maximum possible number of machine hours is three hundred and sixty. The entire firm's output can be sold and the profit made is Sh. 80 per tonne of X and Sh. 120 per tonne of Y.
- i. Formulate the above as a linear programming problem. (5Marks)
- ii. Using the graphical method, determine the number of tonnes of X and Y that the company should produce, hence the maximum profit. (10 Marks)