



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2019/2020

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE

BMS 102: MANAGEMENT MATHEMATICS II

DATE: Wednesday, 28th October 2020

TIME: 8.00 a.m. - 10.00 a.m.

INSTRUCTIONS:

Question ONE is compulsory.

Answer any other TWO questions.

QUESTION ONE (30 MARKS)

- (a) Explain the various uses of markov chains in business and economics. (4 marks)
- (b) A store sells books and CD's. All the books have the same price and all the CD's have the same price, ut different from that of the books. Chikita and Chikito both shopped at the store. Chikita bought 5 books and 3 CD's and paid altogether \$90. Chikito bought 2 books and 8 CD's and paid altogether \$138.
Required: Use matrices to find the cost of one CD. (4 marks)
- (c) A company employs four classes of machine operators (A, B, C, D): all new employees are hired as class D and, through a system of promotion, may work up to a higher class. Currently, there are 200 class D, 150 class C, 90 class B and 60 class A employees. The company has signed an agreement with the union specifying that 20 percent of all employees in each class be promoted, one class in each year. Statistics show that each year 25 percent of the class D employees are separated from the company by reason such as retirement, resignation and death. Similarly 15 percent of class C, 10 percent of class B and 5 percent of class A employees are also separated. For each employee lost, the company hires a new class D employee.
- (i) The transition matrix. (4 marks)
- (ii) The number of employees in each class two years after the agreement with the union. (6 marks)

- (d) A firm has four plants scattered around the city producing the same homogeneous item at all plants. The first plant produces 30 per cent of the total production, second plant 25 per cent, third plant 35 per cent and the fourth plant 10 per cent. The firm has a single warehouse in the city for storing the finished product of all the plants without any distinction. From the past performance records on the proportion of defectives, it has been found that 5 per cent, 10 per cent, 15 per cent and 20 per cent from the items produced at plants 1, 2, 3 and 4 respectively are defective. Before the shipment of the items to a dealer, one unit is selected and found defective. What is the probability that the item was produced in plant 3? (10 marks)

QUESTION TWO (20 MARKS)

- (a) A firm has developed a new product X. They can either test the market or abandon the project. The details are set out below.

Test the market cost Ksh 50,000; likely outcomes are favourable ($P = 0.7$) or failure ($P = 0.3$). If favourable, they could either abandon or produce it when demand is anticipated to be

Low	$P = 0.25$	Loss	Ksh 100,000
Medium	$P = 0.6$	Profit	Ksh 150,000
High	$P = 0.15$	Profit	Ksh 450,000

If the test market indicates failure the project would be abandoned. Abandonment at any stage results in a gain of Ksh 30,000 from the special machinery used.

Required:

- (i) Draw the decision tree showing the nodes and probabilities. (4 marks)
 - (ii) Evaluate the decision tree in (i) above. (7 marks)
- (b) A retail firm orders products from a supplier at a time. The yearly customer demand is 2,400, the cost per unit is sh 4.00, the cost per order is sh 12.00 and the carrying cost is 25% of the purchase cost per unit.
- (i) Derive the EOQ (4 marks)
 - (ii) Determine the optimal number of orders per year. (5 marks)

QUESTION THREE (20 MARKS)

- (a) Explain the purposes of input-output analysis. (5 marks)
- (b) The interactions of three industries X, Y and Z is as shown below

	X	Y	Z	External demand	Total output
X	10	20	10	60	100
Y	25	15	20	30	90
Z	25	25	10	10	70

- (i) Determine the technical coefficient matrix. (5 marks)
- (ii) What must the output of X, Y and Z be, if the external demand for each of their products increases by 20%? (10 marks)

QUESTION FOUR (20 MARKS)

- (a) Explain FIVE assumptions of linear programming as a decision making tool. (5 marks)
- (b) Kibiru and Kiburi (K&K), a company based in the Nairobi, produces two types of products; I and II. Unit profit, in Ksh for product I is 60 and for product II is 50. Each product must pass through two machines: P and Q. Product I requires 10 minutes in machine P and 8 minutes in machine Q. Product II requires 20 minutes in machine P and 5 minutes in machine Q. Machine P is available for 200 minutes a day while machine Q is available for 80 minutes a day. K&K must produce at least two units of product I and five units of product I each day. Units that are not completed in a given day are finished the following day.

Required:

- (i) Formulate the above as a Linear Programming (LP) problem. (5 marks)
- (ii) Use the graphical approach to determine the most profitable daily production plan. (10 marks)