MACHAKOS UNIVERSITY

University Examinations for 2018/2019 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF COMMERCE

BMS102: MANAGEMENT MATHEMATICS II

DATE: 22/7/2019 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS

Answer questions ONE and any other TWO questions.

QUESTION ONE [30 MARKS]

a) Briefly explain four types of costs associated with stock (4 marks)

b) Solve the following system of equations using the matrix approach

$$2x_1 + \mathbf{4x_2} + 6x_3 = 18$$
$$4x_1 + 5x_2 + \mathbf{6x_3} = 24$$
$$\mathbf{3x_1} + x_2 - \mathbf{2_{x3}} = 4$$

(5 marks)

c) Suppose that 6 female and 5 male applicants have been successfully screened for 5 positions. In how many ways can the following compositions be selected

i) 3 females and 2 males

ii) 5 people regardless of sex (2 marks)

d) A manufacturer obtains clock radios from three different subcontractors; 20% from A, 40% from B and 40% from C. The defective rates for these subcontractors are 1%, 3% and 2% respectively. If a defective clock radio is returned by a customer, what is the probability that it came from subcontractor A? (3 marks)

e) A pool of applicants for a welding job consists of 30% women and 70% men. Of the women, 60% have college degrees. Of the men, 40% have college degrees. What is the probability that a randomly selected applicant will be

i) A woman with a college degree (2 marks)

ii) A man without a college degree (2 marks)

f) An auto insurance company classifies its customers in three categories: poor satisfactory and preferred. Each year 40% of those in the poor category are moved to satisfactory, and 20% of those in the satisfactory category are moved to preferred category. Also, 20% in the preferred category are moved to satisfactory category and 20% in the satisfactory category are moved to the poor category. Customer are never moved from poor to preferred, or conversely in a single year. Assuming that these percentages remain valid over a long period of time, how many customers can the company expect to have in each category in the long run? (5 marks)

g) A manufacturer of a deodorant is about to expand production capacity to make a new product. Four alternative production processes are available. The table below shows estimated profits in Ksh for these processes for each of three possible demand levels for the product

	State of Nature		
Action	Low	Moderate	High
Production process	Demand	Demand	demand
A	100,000	350,000	900,000
B	150,000	400,000	700,000
C	250,000	400,000	600,000
D	250,000	400,000	550,000

i) What action is chosen by the maximax criteria (3 marks)

ii) What action is chosen by the maximin criteria (2 marks)

iii) What action is chosen by the minimax regret criteria (2 marks)

QUESTION TWO (20 MARKS)

a) Briefly explain FOUR factors that influence the levels of inventory kept by a given firm (4 marks)

(b) An economy is based on three sectors, agriculture, manufacturing and energy. Production of a dollar's worth of agriculture requires inputs of $0.20 from agriculture, $0.20 from manufacturing and $0.20 from energy. Production of a dollar's worth of manufacturing requires inputs of $0.40 from agriculture, $0.10 from manufacturing, and $0.10 from energy. Production of a dollar's worth of energy requires inputs of $0.30 from agriculture, $ 0.10 from manufacturing, and $ 0.10 from energy.

i) Find the technology matrix M (3 marks)

ii) Find $(\boldsymbol{I} - \boldsymbol{M})^{-1}$ (4 marks)

iii) Find the output from each sector that is needed to satisfy a final demand of$10 billion for agriculture, $15 billion for manufacturing, and $20 billion forenergy. (4 marks)

QUESTION THREE (20 MARKS)

A company produces three products P, Q and R from two raw materials A and B and labour L. One unit of product P requires one unit of A, 3 units of B and 2 units of L. One unit of product Q requires 2 units of A and B each, and 3 units of L, while one unit of R needs 2 units of A, 6 units of B and 4 units of L. the company has a daily availability of 8 units of A, 12 units of B and 12 units of L. it is further known that the unit contribution margin for the products is Sh. 3, 2 and 5 respectively for P, Q and R. formulate the problem as a linear programming problem and then solve it to determine the optimum product mixusing graphical and simplex method.

QUESTION FOUR (20 MARKS)

An aircraft uses high tensile bolts at an approximately constant rate of 50,000 units per year. The bolts cost Sh. 20 each and the purchase department estimated that the cost of placing an order is Sh. 5,000. The holding cost per unit is 15% of the unit cost. No shortages are allowed. Required:

a) What is the economic order quantity? (4 marks)

b) How frequently should the orders be placed? (4 marks)

c) If orders could be executed only once in two months, the ordering quantity would be higher than the optimal quantity. By this what would be the change in the total cost? (3 marks)

d) The company has received the following offer from the supplier:

Quantity	**Price per unit**
Up to 20,000 pieces per order	20.00
Above 20,000 pieces up to 30,000	19.50
Above 30,000 pieces up to 45,000	19.25
Above 45,000	19.00

Should they make use of this offer? (6 marks)

e) If the entire requirements have to be bought in a single order, what should be the justifiable unit price offer to the company? (3 marks)

QUESTION FIVE (20 MARKS)

a) State four assumptions of input-output model 8 marks)

b) An aircraft uses high tensile bolts at an approximately constant rate of 50,000 units per year. The bolts cost Sh. 20 each and the purchase department estimated that the cost of placing an order is Sh. 5,000. The holding cost per unit is 15% of the unit cost. No shortages are allowed. Required:

i) What is the economic order quantity? (4 marks)

ii) How frequently should the orders be placed? (4 marks)

iii) If orders could be executed only once in two months, the ordering quantity would be higher than the optimal quantity. By this what would be the change in the total cost? (4 marks)