



MURANG'A UNIVERSITY OF TECHNOLOGY
SCHOOL OF AGRICULTURE AND ENVIRONMENTAL
SCIENCES

DEPARTMENT OF AGRICULTURAL SCIENCE

UNIVERSITY POSTGRADUATE EXAMINATION

2023/2024 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATION FOR MASTER OF
SCIENCE IN AGRICULTURAL ECONOMICS

AEC604: OPERATIONS RESEARCH

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question one and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (25 MARKS)

- a. As a depot manager of NCPB Kenya explain the steps you would take to manage the cost of distributing subsidized fertilizer in Kirinyaga country. (12 marks)
- b. Consider the following linear programming problem
- i. $Minimize P = 3x_1 + 2x_2$
subject to
 $2x_1 + x_2 \leq 100$
 $x_1 + x_2 \leq 80$
 $x_1 \leq 40$
 $\forall x_i \geq 0, i = 1, 2$
- ii. Formulate the standard form of the LP problem (4 marks)
- c. Express the equation on the compact form. (3 marks)
- d. Given $x_1 + x_2 = 3$
 $-x_2 + x_3 = -1$
 $x_1 + x_2 \leq 3$
 $-x_1 + x_3 \leq -1$
Identify the basic feasible and non-basic variables. (6 marks)

QUESTION TWO (20 MARKS)

As furniture company producers un expensive table and chairs, the production process for each is similar in that it requires a certain number of hours of competing and certain nuclear of labour hour of competing and certain number of labour in the planting department

Each table require 4hrs of carpentry and 2 hrs in the pantry painting department. Each chair requires 3 hrs of carpentry and 1hr at the pantry department. During the current production period there are 240 hrs in the carpentry company and 100 hrs of pantry available. Each table earn a profit of 7 used and chair is 5 used.

Required:

- a. Find the optional combination of table and chairs to manufacture under 10 maximize profit. (15 marks)
- b. Highlight the objectives of operations research. (5 marks)
- c. What are the factors that limits its application in business? (5 marks)

QUESTION THREE (20 MARKS)

a. Solve the following problem using the simple method.

i. Maximize $P=70x_1+50x_2$

$$4x_1+3x_2 \leq 240$$

$$2x_1+x_2 \leq 100$$

$$x_1, x_2 \geq 0.$$

ii. Maximize $P = 70x_1 + 50x_2$

subject to

$$4x_1 + 3x_2 \leq 240$$

$$2x_1 + x_2 \leq 100$$

$$\forall x_i \geq 0, i = 1, 2$$

(15 marks)

b. Given the table below, how many tonnes of wheat would be transported by each grain elevator to each mill on a monthly basis to minimize the cost of transportation. (10 marks)

Grain elevator supply		Mill demand	
Kansas City	150	Chicago	200
Omaha	175	St Louis	100
Des Moines	275		--300

Cost table

	A	B	C
Kansas City	6	8	10
Omaha	7	11	11
Des Moines	4	5	12

QUESTION FOUR (20 MARKS)

a. Describe the characteristics of operations research.

(7 marks)

b. Describe classification of different types of models we use in operation research studies.

(10 marks)

c. Highlight the characteristic of linear programming model.

(8 marks)