(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

THIRD YEAR 2ND SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE AGRICULTURE ECONOMICS AND RESOURCE MANAGEMENT

COURSE CODE: AEC 325
COURSE TITLE: OPERATIONS RESEARCH

DATE: 21ST JANUARY 2022 **TIME:** 11 – 1 PM

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO Questions.

TIME: 2 Hours

This paper consists of 3 printed pages. Please Turn Over

Question 1

a) Explain the following terms used in operations research

(i) Surplus variable (2 Marks)

(ii) Basic variable (2 Marks)

(iii) Transportation problem (2 Marks)

(iv) Post optimality (2 Marks)

b) Highlight four applications of Operations Research (4Marks)

c) Highlight four limitations of Operations Research (4Marks)

d) With the aid of a diagram, (14 Marks)

Maximize: $z = 5x_1 + 10x_2$

subject to: $x_1 + 3x_2 \leq 90$

$x_1 + 2x_2 \leq 120$

$x_1 + x_2 \leq 100$

$x_1, x_2 \geq 0.$

Question 2

a) Explain four assumptions about linear programming (8 Marks)

b) Solve the following using the simplex method

Maximize: $z = 6x_1 + 8x_2$

subject to: $5x_1 + 10x_2 \leq 60$

$4x_1 + 4x_2 \geq 40$

$x_1, x_2 \geq 0.$ (6 Marks)

hence find new solutions if

the Right Hand side constraints of the constraint 1 and constraint 2 are changed from 60 and 40 to 40 and 20 respectively. (6 Marks)

Question 3

a) What are types of transportation problem? Explain them with suitable examples? (6 Marks)

b) A transport company purchased a motor vehicle for Kes 80000/-. The resale value of the vehicle keeps on decreasing from Kes 70000/- in the first year to Kes 5000/- in the eighth year while, the running cost in maintaining the vehicle keeps on increasing with Kes. 3000/- in the first year till it goes to Kes 20000/- in the eighth year as shown in the below table. Determine the optimum replacement policy? (14 Marks)

Figure: Yearly Scrap Value and Running Cost								
Year	1	2	3	4	5	6	7	8
Scrap Value	70000	61000	55000	49000	32000	20000	10000	5000
Running Cost	3000	3600	4800	5000	8000	11200	15000	20000

Question 4

A farmer has recently acquired a 120 hectares piece of land. He has decided to grow Wheat and barley on that land. Due to the quality of the sun and the region's excellent climate, the entire production of Wheat and Barley can be sold. He wants to know how to plant each variety in the 120 hectares, given the costs, net profits and labor requirements according to the data shown below:

Variety	Cost (Price/Ha)	Net Profit (Price/Ha)	Man-days/Ha
Wheat	100	50	10
Barley	200	110	40

The farmer has a budget of US$10,000 and availability of 1,200 man-days during the planning horizon. Find the optimal solution and the optimal value. (20 Marks)