(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 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: 8TH AUGUST 2023 **TIME:** 8 – 10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO Questions.

TIME: 2 Hours

This paper consists of 3 printed pages. Please Turn Over

PLEASE PROVIDE A GRAPH PAPER WITH THIS EXAM

QUESTION ONE

30 MARKS

a) What is OR and in which five areas can it be applied. (10 marks)

b) Define the following terms (10 Marks)

i. Slack Variable:
ii. Constraint functions:
iii. Optimum Solution:
iv. Delivery Lag:
v. Carrying Cost

c) Explain the term dual problem and outline the steps you would follow to formulate a dual problem (10 marks)

QUESTION TWO

20 MARKS

a) Explain the following terms as used in Operations Research (10 Marks)

i. Game Theory
ii. Pure Strategy
iii. Non-Zero game
iv. Two person and N-person game
v. Saddle point

b) Suppose a manufacturing company owns three factories (sources) and distribute his products to five different retail agencies (destinations). The following table shows the capacities of the three factories, the quantity of products required by the various retail agencies and the cost of shipping one unit of the product from each of the three factories to each of the five retail agencies

	Retail Agency					
Factories	**1**	**2**	**3**	**4**	**5**	**Factory Capacity**
1	1	9	13	36	51	50
2	24	12	16	20	1	100
3	14	33	1	23	26	150
Requirement of retail agencies	100	60	50	50	40	300

Formulate this transportation problem as a linear programming problem (10 Marks)

QUESTION THREE

20 MARKS

a) Explain the economic factors that affect inventory? (10 Marks)

b) A manufacturer uses an item at a uniform rate of 25,000 units per year. Assume that no shortage is allowed and delivery is at an infinite rate. The ordering, receiving and transportation cost is KSh. 23 per order, while inspection cost is KSh.22 per order. Interest cost is KSh.0.056 and deterioration and obsolescence cost is KSh.0.004 respectively per year for each item actually held in inventory plus KSh.0.02 per year per unit based on the maximum number of units in inventory. Determine the EOQ. If lead time is 40 days, find reorder level. (10 Marks)

QUESTION FOUR

20 MARKS

A project consists of seven activities with time estimates for each activity as indicated in the table below. Calculate the expected project completion time; variance and standard deviation of the critical path and the project.

Activity	A	B	C	D	E	F	G
Predecessor Activity	-	A	A	A	B	C	D, E, F
Optimistic time estimate in days (to)	2	2	6	2	2	6	6
Most likely time estimate in days (tm)	5	3	8	4	6	7	8
Pessimistic time estimate in days (tp)	8	4	10	6	10	8	10

QUESTION FIVE

20 MARKS

A company owns two flour mills; A and B, which have different production capacities for high, medium and low quality flour. The company has entered a contract to supply flour to a firm every month with at least 8, 12 and 24 tons of high, medium and low quality respectively. It costs the company KSh.2000 and KSh.1500 per day to run mill A and B respectively. On a day, Mill A produces 6, 2 and 4 tons of high, medium and low quality flour, Mill B produces 2, 4 and 12 tons of high, medium and low quality flour respectively. Using the graph method, find out how many days per month should each mill be operated in order to meet the contract order most economically.