



MAASAI MARA UNIVERSITY
REGULAR UNIVERSITY EXAMINATIONS
2023/ 2024 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
SCHOOL OF BUSINESS AND ECONOMICS.
DEGREE IN BACHELOR OF ECONOMICS.

COURSE CODE: ECO 3107-1

COURSE TITLE: OPERATIONS RESEARCH.

DATE: DEC, 2023

TIME:

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO questions

This paper consists of FOUR printed pages. Please turn over.

QUESTION ONE

- a. Give two differences between graphical and algebraic methods of solving linear programming problems **(4 marks)**
- b. Explain what is meant by optimality condition and feasibility condition **(4 marks)**
- c. PERT/CPM networks consists of two major components, discuss **(4marks)**
- d. Kenya airlines uses 650 taillights in every year. Each time an order for taillights is placed, an ordering cost of 450 shillings is incurred. Each light cost 50 shillings and holding cost is 10 shillings per light per year. Assume that demand occur at constant rate and shortages are not allowed. What is EOQ and how many time will elapse between the placement of orders? **(4 marks)**
- e. Consider the following linear programming, provide the algebraic solution for the model.
- Maximize $z = 2x_1 + 3x_2$
Subject to: $2x_1 + x_2 \leq 4$
 $x_1 + 2x_2 \leq 5$
 $x_1, x_2 \geq 0$ **(4 marks)**

QUESTION TWO

- a. In a departmental store one cashier is there to serve the customers. And the customers pick up their need by themselves. The arrival rate is 8 customers for every 4 minutes and the cashier can serve 10 customers in 4 minutes. Assuming Poisson arrival rate and exponential distribution for service rate, find:
- i. Average number of customers in the system **(2 marks)**
- ii. Average queue length **(2 marks)**
- iii. Average time a customer spend in the queue **(2 marks)**
- iv. Average time a customer spend in the system **(2 marks)**
- b. A department head has four subordinates, and four tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate of the time each person would take to perform each task is given in the table. How should the tasks be allocated, one to a person, so as to minimize the total man-hours?

TASKS	MAN				
		I	II	III	IV
	A	8	26	17	11
	B	13	28	4	26
	C	38	19	18	15
D	19	26	24	10	

(7 marks)

QUESTION THREE

- a. Kericho tea company produces tea for local use, internal market and external/export from three tea plant species, T1, T2 and T3, as provided in the following table.

Tea plant	Tons of tea			Maximum daily available tons
	Local use	Internal use	External use	
T1	1	2	1	430
T2	3	0	2	460
T3	1	4	0	420
Profit per ton (Ksh.1000)	3	2	5	

Kericho tea company wants to determine the optimum (best) product mix for local, internal and external market that maximizes the daily profit. Find an optimal solution to this problem using the simplex technique.

(15 marks)

QUESTION FOUR

- a. The costs in dollars of driving a truck between cities as well as the surplus and shortage values of each metropolitan area is provided in the following table. Find the optimum solution using Vogels method

(7 marks)

Origin (surplus area)	Destination (shortage area)			Supply (surplus of trucks)
	1	2	3	
1	50	100	100	110
2	200	300	200	160
3	100	200	300	150
Demand (shortage)	140	200	80	420

- b. Bata shoe company produces shoes for internal and external markets from two raw materials, R1 and R2. The following table provide the data.

	Tons of raw materials		Maximum daily available (tons)
	Internal market	External market	
R1	5	4	22
R2	1	2	7
Profit per ton	6	4	

Determine the optimum distribution for internal and external markets that maximizes the daily profits using algebraic method **(8 marks)**

>>>>>Good Luck>>>>>