(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR

FIFTH YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN ELECTRICAL AND COMMUNICATION ENGINEERING

COURSE CODE: ECC 501

COURSE TITLE: OPERATION RESEARCH

DATE: TUESDAY 19/12/2023   TIME: 3: 00 PM – 5:00 PM

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.
QUESTION ONE CARRIES 30 MARKS AND ALL OTHERS 20 MARKS EACH.

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

1

QUESTION ONE (30 Marks)

a) Define the following terms as used in operations research

(5 Marks)
   i. Optimization
   ii. Objective function
   iii. Decision variable
   iv. Linearity
   v. None negativity

b) State any **four** assumptions made when applying linear programming in solving transportation problem(s). (4 Marks)

c) A metal industry has three metals production units located across the country with production capacity of 80, 100 and 150 pieces. The industry must distribute the metals to its four hardware stores A, B, C and D with at least 60, 70, 80 and 80 pieces respectively. Find the optimal cost, given the information in table below. (10 Marks)

	A	B	C	D	Supply
I	6	6	12	11	80
II	8	10	8	9	100
III	7	9	8	110	150
Demand	70	80	100	80	330

d) Maximize $v = y + 8x$ subject to the constraints (5 Marks)
$$y \leq 40 - x$$
$$2x \leq 60 - y$$
With $x, y \geq 0$

e) Explain **three** effects of changes in the RHS value of constraints. (6 Marks)
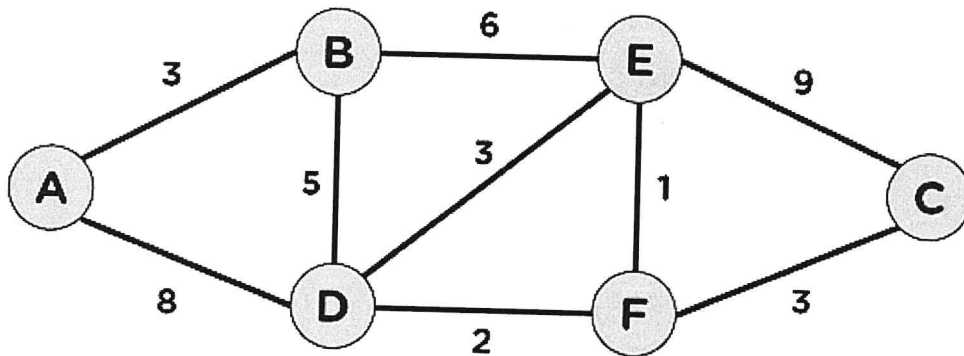
QUESTION TWO (20 MARKS)

a) Apply least cost method obtain the initial feasible solution for the following transportation problem. (10 Marks)

Factory	E	F	G	H	Capacity
A	3	8	5	6	35
B	4	4	2	9	28
C	6	5	8	8	21
D	2	7	3	15	24
Demand	17	19	28	44	108

b) Describe the first three steps in a Hungarian Method as a way of solving assignment problem in operations research (6 Marks)

c) State any **four** applications of Floyd's Algorithm in operations research (4 Marks)

QUESTION THREE
(20MARKS)

a) Apply Dijkstra's Algorithm for the figure given below then find the shortest path from node A to node C.
(10 Marks)

b) Outline the procedure of writing an objective function. (4 Marks)

c) Describe any **three** problems where concepts in operational research can be used in production management.
(6 Mark

QUESTION FOUR
Marks)
(20

a) There are three factories located at different locations supplying products to five retail agencies. Cost of unit product transportation is given in the following matrix. Determine the total transportation cost with the help of stepping stone method.

(12 Marks)

		Retail Agencies					
		R1	R2	R2	R4	R5	Supply
Source Factories	C1	2	10	14	37	52	50
	C2	25	13	17	21	2	100
	C3	15	34	2	24	27	150
	Demand	100	70	50	40	40	300

b) State any **three** benefits of Modified Distribution Method (MODI) over stepping stone method. (3 Marks)

c) Find the minimum value of $w = 3x + 2y$, subject to: (5 Marks)

$$2x + y \geq 6$$
$$x + y \geq 4$$
$$x \geq 0; y \geq 0$$