The Management University of Africa

MUA

Sponsored by the Kenya Institute of Management

UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF BACHELOR OF MANAGEMENT AND LEADERSHIP

BML 303: OPERATIONS RESEARCH

DATE: 31ST JULY 2024

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

b) Define the following terms as used in linear programming

i. Infeasibility **(2 Marks)**

ii. Redundancy **(2 Marks)**

iii. Shadow price **(1 Marks)**

iv. Feasible solution **(1 Marks)**

v. Basic solution **(1 Marks)**

QUESTION FOUR

a) Identify the 2 basic assumptions of the transportation model **(2 Marks)**

b) A Company has three depots, P, Q and R for its produce with capacity of 48, 144 and 168 units respectively. The depots supply the produce to four towns, W, X, Y and Z whose demands are: 72, 72, 96 and 120 units respectively. The per unit transport cost in US Dollars from one depot to a given town are given in the table below.

DEPOT	TOWNS			
	W	X	Y	Z
P	104	88	120	160
Q	130	114	120	104
R	124	144	122	96

Find the associated transportation cost using:

i. Least Cost Method **(4 Marks)**

ii. North West Corner Method **(4 Marks)**

iii. Vogel's Approximation Method **(5 Marks)**

QUESTION FIVE

a) Management University of Africa Computer institute has got four expert programmers. The institute needs four application programmes to be developed by either of the expert. The head of the institute, after studying carefully the programmes to be developed, estimates the computer time in minutes required by the respective experts to develop the application programmes as follows.

Programmers	Programmes			
	Prog. 1	Prog. 2	Prog. 3	Prog. 4
Nelly	120	100	80	90
Ben	80	90	110	70
Jeff	100	140	120	110
Tailor	90	90	80	90

Assign the programmes to each respective programmer in a matter that the computer time is minimized **(9 Marks)**

b) Describe the phases of operation research **(6 Marks)**

QUESTION SIX

a) The following is the payoff matrix for player A and Player B

PLAYER A	PLAYER B	
	b_1	b_2
a_1	2	4
a_2	5	3

Required

Find the value of the game and optimal strategies for each player **(10 Marks)**

b) Using the following information, calculate the weighted moving average for three period.

Months	Jan	Feb	March	April
Demand	200	700	150	400
Weight/ probability	0.2	0.1	0.3	0.4

(5 Marks)

FORMULAS

$P = \frac{\lambda}{\mu}$ $\quad N_q = \frac{\lambda^2}{\mu(\mu-\lambda)}$ $\quad N_s = \frac{\lambda}{(\mu-\lambda)}$

$T_q = \frac{\lambda}{\mu(\mu-\lambda)}$ $\quad T_S = \frac{1}{(\mu-\lambda)}$

Input-Output Model, $X = (I_n - M)^{-1} \times d$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$