



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BUSINESS & ECONOMICS
UNIVERSITY EXAMINATION FOR **MASTER OF LOGISTICS AND SUPPLY CHAIN**
MANAGEMENT
1ST YEAR 1ST SEMESTER 2023/2024 ACADEMIC YEAR
MAIN & KISUMU CAMPUS

COURSE CODE: MBM 5112

COURSE TITLE: QUANTITATIVE ANALYSIS FOR DECISION MAKING

DATE: 30/04/2024

EXAM SESSION: 9.00 – 11.00 AM

DURATION: 3 HOURS.

INSTRUCTIONS

- 1. Answer any FOUR questions**
- 2. Show ALL your workings and be as NEAT as possible.**
- 3. Candidates are advised not to write on the question paper**
- 4. Marks allocated to each question are shown at the end of the question.**

Question One

a) Briefly explain what you understand by each of the following, giving an example in each case:

- (i) Scalar matrix
- (ii) The earliest start time of an activity
- (iii) Non-negativity requirement in linear programming
- (iv) The total time spent in a queuing system [8 Marks]

b) Solve the following using matrix algebra; [6 Marks]

$$\begin{array}{rclcl} 8X & + & 5Y & = & 90 \\ 6X & + & 4Y & = & 66 \end{array}$$

c) A cost accountant developed the weekly marginal revenue (MR) and the total cost (TC) functions based on the level of output (Q) as given below:

$$MR = 280 - 4Q$$

$$TC = Q^2 - 80Q + 3,600$$

Using the above functions, you are required to determine:

- (i) The revenue maximizing level of output and the maximum revenue [4 Marks]
- (ii) The profit maximizing output and the maximum profit [6 Marks]

d) Customers arrive at the First Class Ticket Counter of a Theatre at the rate of 15 per hour. There is one clerk serving the customers at the rate of 27 per hour.

- (i) What is the probability that the server at the counter is idle [2 marks]
- (ii) How long does a customer wait in the queue for a ticket [2 marks]
- (iii) How many customers are expected to be on the queue [2 marks]

Question Two

a) Explain the following terms as used in network [6 Marks]

- (i) Network diagram
- (ii) Critical activity
- (iii) Pessimistic time

b) You are provided with the following information relating to a project made up of 8 activities, A-H.

Activity	Predecessor	Activity duration in weeks		
		Optimistic	Most likely	Pessimistic
A	-	3	6	9
B	-	2	5	8
C	A	2	4	6
D	B	2	3	10
E	B	1	3	11

F	E	4	6	8
G	F	1	5	15
H	C,D,E	2	5	8

Required:

- i) Prepare a network diagram, show the critical path. [5 Marks]
- ii) Determine the expected project duration and the critical path [8 Marks]
- iii) Compute the standard deviation of the expected project duration. [4 Marks]

Question Three

- a) Briefly, explain four assumptions of linear programming [6 Marks]
- b) Solve the following linear programming problem graphically and show the optimum solution [14 Marks]

$$\text{Max } Z = 200X + 120Y$$

Subject to

$$60X + 40Y \leq 2400$$

$$X \leq 300$$

$$Y \leq 400$$

$$X, Y \geq 0$$

Question Four

- a) Outline four requirements for the transportation model [4 marks]
- b) A bakery stocks a popular brand of cake. The bakery operates six days in a week. The daily demand in cartons based on past experience is given below:

Demand	0	5	10	15	20	25	30	35
Probability	0.03	0.08	0.15	0.25	0.21	0.14	0.09	0.05

Using the following series of random numbers, simulate the demand for the next two weeks [48,94,06,78,36,77,18,29,68,87,32,54] [8 marks]

- c) Four different jobs can be done by four different machines. The costs associated with set up and running the machines for the four jobs/ machines are as shown below:

		Machines			
		M1	M2	M3	M4
	J1	5	7	11	6
	J2	8	5	9	6
Jobs	J3	4	7	10	7
	J4	10	4	8	3

Required

Determine how the jobs should be assigned to the machines in order to minimize costs

[8 marks]

Question Five

- a) Explain any four assumptions of game theory. [4 marks]
- b) Briefly explain each of the following terms as used in quantitative analysis
 - (i) Transition matrix [2 marks]
 - (ii) Technological matrix [2 marks]
 - (iii) Pure strategy game [2 marks]
 - (iv) Shadow price [2 marks]
 - (v) Feasible region [2 marks]
- c) Justify the study of quantitative methods to a business entity. [6 marks]