



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS

SECOND SEMESTER

SCHOOL OF BUSINESS & ECONOMICS

MASTER OF BUSINESS ADMINISTRATION

COURSE CODE: MBA 8210

COURSE TITLE: OPERATIONS RESEARCH

DATE: 27TH APRIL 2018.

TIME: 11.00-1400HRS

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other THREE questions

QUESTION 1

- a) The annual demand of an item in a leading supermarket in Kenya is 9000 units. Its annual carrying cost is 15% of the purchase price of the item per year, where the purchase price is Shs 20 per unit. The ordering cost is Shs 15 per order. Presently the order size of the item is the average monthly demand of that item. Find the economic order quantity [7 Marks]
- b) Compare its cost with the present ordering system and find the corresponding cost advantage if it exists. [6 Marks]
- c) Briefly, define the following terms:
- i) Queue jockeying [4 marks]
 - ii) Slack variable [4 marks]
 - iii) Gantt Chart [4 marks]

QUESTION 2

Solve the following Linear programming problem graphically.
[15 Marks]

$$\text{Maximize } Z = 100X_1 + 50X_2$$

Subject to:

$$4X_1 + 6X_2 \leq 24$$

$$X_1 \leq 4$$

$$X_2 \leq 4/3$$

$$X_1, X_2 \geq 0$$

QUESTION 3

The arrival rate of customers at a banking counter follows Poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 60 per hour.

- a) What is the probability of having 0 customers in the system (p_0)? [3 Marks]
- b) What is the probability of having 5 customers in the system (p_5)? [3 Marks]
- c) What is the probability of having 10 customers in the system (p_{10})? [3 Marks]
- d) Find L_s , L_q , W_s and W_q . [6 Marks]

QUESTION 4 (CRITICAL PATH MODEL)

The table below summarizes the details of a project involving 14 activities

Activity	Immediate Predecessor(s)	Duration (months)
A	-	2
B	-	6
C	-	4
D	B	3

E	A	6
F	A	8
G	B	3
H	C,D	7
I	C,D	2
J	E	5
K	F,G,H	4
L	F,G,H	3
M	I	13
N	J,K	7

- a) Construct the critical path method (CPM). [5 marks]
- b) Determine the critical path and project completion time. [5 Marks]
- c) Compute total floats and free floats for non-critical activities. [5 Marks]

QUESTION 5

Suppose you are solving a maximization problem using the simplex method of linear programming. After obtaining the initial simplex table below:

	C _j	6	8	0	0		
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C _B i	Basic Variable	X ₁	X ₂	S ₁	S ₂	Solution	Ratio
0	S ₁	5	10	1	0	60	6
0	S ₂	4	4	0	1	40	10
	Z _j	0	0	0	0	0	
	C _j -Z _j	6	8	0	0		

Your supervisor informs you that the results in the table do not give an optimal solution for the maximization problem.

a) Why do you think your supervisor has arrived at this conclusion? [2 Marks]

b) In preparation for the first iteration, which variable is leaving and which one is entering the basis? Give reasons for your answers. [3 Marks]

c) Construct the table for the next iteration for this problem? [10 Marks]