CHUKA **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION

MSOM 822: OPERATIONS RESEARCH

STREAMS: MSOM   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 06/12/2018   **2.30 P.M – 4.30 P.M**

INSTRUCTIONS
- **Answer any four questions**

1.   (a) Describe any five decision variables in the analysis of queuing problem. [5 marks]

(b) Discuss any five queuing discipline used in Kenya to serve customers in a busy

organization.   [5 marks]

(c) A tax consultancy firm has four service counters in its office to receive tax payers

complaints about their value added tax (VAT) returns at the end of the financial year.

Customers are allowed to queue in only one line and are served on first come first served

basis. The arrivals average 80 customers in a 8 hour service day. Each tax advisor spends

an irregular amount of time serving the customers and the service time has been found to

be exponentially distributed. The average service time is 20 minutes.

Calculate

(i)   The average number of customers in the system.   [3 marks]

(ii)   Te average number of customers waiting to be served.   [3 marks]

(iii)   The average time a customer spends in the system.   [3 marks]

(iv)   The average waiting time for a customer.   [3 marks]

(v)   The number of hours in a week that a tax adviser spends perform his/her job.

                                                                                                 [3 marks]

2.   (a) State and explain any five benefits of quality in linear programming.   [5 marks]

(b) Write a dual problem from the following linear programming problem.[5 marks]

Minimize $z = 3x_1 - 2x_2 + 4x_3$

Subject to the following constrants

$3x_1 + 5x_2 + 4x_3 \geq 7$

$6x_1 + x_2 + 3x_3 \geq 4$

$7x_1 - 2x_2 - x_3 \leq 10$

$x_1 - 2x_2 + 5x_3 \geq 0$

$4x_1 + 7x_2 - 2x_3 \geq 0$

$x_1 x_2 x_3 \geq 0$

(c) ABC engineering co ltd has obtained a contract to supply on alloy steel. The alloy needs three metals X,Y and Z. The metals are available from dealers who supply them in standardized boxes that are labelled by code numbers 121, 321 and 115 respectively. Box 121 contains 1 unit of X, 2 units of Y and 1 unit of Z: box 321 contains 3 units of X, 2 units of Y and 1 unit of Z,where as box 115 contains 1 unit of each X and Y and 5 units of Z. The cost of one box of type 121 ,321 and 115 ksh1,200,ksh 900 and ksh 1,500 respectively.

Required :

(i)   Formulate the problem as a linear programming problem.   [6 marks]

(ii)   Formulate the dual problem of the problem (i) above.   [3 marks]

(iii)   Determine the entering variable, leaving variable and pivot element for the dual problem.   [6 marks]

3.   (a) Describe five areas of application of the markov processes in business and management.   [5 marks]

(b) State and explain the stages in determining the equilibrium conditions in a markov process.   [5 marks]

(c) A small town in the remote parts of the north Eastern Kenyahas three grocery stores. Because of its location there are no new customers nor are the old customers leaving the area. During a slack period the three grocery operators got together and conducted a study on the number of customers that each customer visited in the past. The data is summarized in the table below.

Grocer		Customers in Jan period 1	Change during the year		Customer in Jan period 2
		Gain	Loss		
1	500	100	100		500
2	400	75	100		375
3	500	50	25		525

The following table shows the details of the gains and losses.

<div align="center">GAINS   LOSSES</div>

Grocer	From 1	From 2	From 3	To 1	To 2	To 3
1	0	100	0	0	50	50
2	50	0	25	100	0	0
3	50	0	0	0	25	0

Required :

(i) Construct the state transaction matrix.   [5 marks]

(ii) Market shares of the three grocers in period 3 and 4. [4 marks]

(iii) Market shares of the three grocers after a very long time. [6 marks]

4. (a) Explain any five beefs of using network analysis in managing projects. [5 marks]

   (b) State any two assumptions in crashing projects.   [4 marks]

   (c) A project consists of the following activities.

Activity	Proceeding activity	Normal Time	Cost	Crash Time	Cost
A	-	30	90,000	25	105,000
B	-	25	180,000	20	190,000
C	-	10	50,000	8	54,000
D	C	10	7,500	7	9,000
E	B,D	10	4,200	10	4,200
F	A,E	20	20,000	16	30,000
G	A,E	35	28,000	30	35,500

H	B,D	20	12,000	18	15,000
I	F	20	14,000	15	24,000

Required :

(i)   Draw a network diagram for the project.   [4 marks]

(ii)   Determine the critical path and project duration.   [2 marks]

(iii)   Calculate the cost slopes for the activities.   [4 marks]

(iv)   If the project duration is to be reduced by 4 days determine the activities to be

crashed and the crash costs.   [6 marks]

5.   (a) State any five benefits of inventory control and management to an organization.

[5 marks]

(b) Using suitable examples explain the application of the principles of dominance as

used in game theory.   [5 marks]

(c) Discuss the circumstances in which the economic order quantity may not be used in

buying items.   [5 marks]

(d) A company uses 10,000 units of an item per annum. The cost of the item is ksh 5 per

unit and the order. The carrying of the inventory is estimate to be 25% . The consumption

rate is constant per year.

Calculate ;

(i)   The economic order quantity   [4 marks]

(ii)   The member of orders per year.   [2 marks]

(iii)   Total inventory costs per year.   [4 marks]