CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

**THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE
OF BACHELOR OF COMMERCE**

BCOM 361: OPERATION RESEARCH II

STREAMS: BCOM Y3S1   **TIME: 2 HOURS**

DAY/DATE: FRIDAY 8/12/2017   **11.30 A.M - 1.30 P.M.**

INSTRUCTIONS:
- **Answer Question ONE and any other TWO Questions**

QUESTION ONE [30 MARKS]
(a) Discuss any five reasons that explain why a simulation process in used in decision making.
[10 Marks]

(b) State and explain the methods that are used to determine the initial solution for transportation problems.   [10 Marks]

(c) An investor intends to produce two competing products which are expected to share the available market equally.   The marketing research department of the Investors Company has determined the state transition matrix for the product to be:

$$\text{From} \quad \begin{pmatrix} 0.9 & 0.1 \\ 0.5 & 0.5 \end{pmatrix} \quad \text{To}$$

It is assumed that the conditions of the first order markov process will apply.

Required:
(i) The marker shares of the two products in the first two products.   [4 Marks]
(ii) The marker shares of the product at the equilibrium state.   [6 Marks]

QUESTION TWO
(a) State and explain the steps in solving a simulation problem.   [8 Marks]

(b) Atieno is a trader who sells fried fish at Gikomba Market, Nairobi. She buys the fish at Kshs.250 per kg and sells at Kshs.350 per kilogram on the same day. The following information relates to her sales pattern for a period of 300 days.

Quantity purchased	No. of days	Quantity demanded	No. of days
100	40	100	55
200	50	200	65
300	90	300	80
400	80	400	70
500	40	500	30

If the fish is not sold on the same day then it is worthless.

Required:
Simulate the operations for a period of 10 days and show the profit made per day using the following random numbers.
44583922549643109328136485197702334570&84667   [12 Marks]

QUESTION THREE
(a) Discuss the factors that lead to the replacement of assets.   [10 Marks]

(b) A small supermarket has a single cashier.   During rush hours customers arrive at the rate of 20 per hour. The average number of customers that can be processed by the cahier is 24 per hour. Assume that the condition of single channel single phase queuing mode applies.

Required:
(i) Service utilization factor.   [2 Marks]
(ii) The number of customers in the system.   [2 Marks]
(iii)The average time that a customer spends in the system.   [2 Marks]
(iv)The average number of customers in the queue.   [2 Marks]
(v) The average time a customer spends in queue waiting for service.   [2 Marks]

QUESTION FOUR
(a) Discuss the methods that are used to determine the optimal solution in a transportation problem.   [8 Marks]

(b) Mlandi Ltd manufactures three products A, B and C which pass through three machines X, Y and Z. They also incur different variable manufacturing costs. The table below shows the processing costs incurred per unit of each product through each machine.

	Machines			
	X	Y	Z	Required Units
Produce A	60	50	70	30,000
B	70	70	90	100,000
C	50	40	60	80,000
Capacity	80,000	60,000	70,000	

Using the transportation model, determine

(i) The optimal units to be produced by each machine to satisfy demand using the Vogels Approximation. [8 Marks]

(ii) The manufacturing costs to produce the optimum units. [4 Marks]

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