CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

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

BCOM 361: OPERATIONS RESEARCH II

STREAM: BCOM (ODEL)Y3S2 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 11/04/2023 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS:

- **Answer question ONE and any other TWO questions**
- **Do not write on the question paper**

Q1. (a) Explain the consequences of failing to replace productive assets at their appropriate times. [10 marks]

(b) Using suitable examples, explain the terms absorbing state and equilibrium condition as used in the Markov analysis. [10 marks]

(c) A company that produces a single product is planning to introduce a second product in the same market. The marketing department has estimated that the first product will command 80% of the market in the initial stage. The marketing department has also estimated the state transition matrix for the two products to be.

$$\begin{pmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{pmatrix}$$

It is assumed that the conditions of the fist order Markov process will apply.

Required:

(i) Market shares of the two products in the first two period [4 marks]

(ii) Market shares of the two products at equilibrium [6 marks]

2. (a) Explain the procedure followed in solving the operations research problems using simulation. [8 marks]

(b) Ndagani Bakaries ltd is a business that stated recently. The bakery produces 300 loaves of bread per day. The sale of bread depends on many variables and the demand for the last few days has the following frequency distribution

Demand units	Probability
270	0.10
280	0.15
290	0.20
300	0.35
310	0.15
320	0.05

The production cost per piece of bread is estimated to be ksh 50 and the sale price is kshs 60. Any unsold product has no saleable value as customers demand only fresh products of the same day.

Required:

(i) Using the following random numbers, simulate the operations of 10 days showing profit/loss for each day. [6 marks]

10: 99: 65: 97: 90: 01: 79: 11: 16: 20

(ii) Comment about your results on (i) above and advice the company on the production policy. [2 marks]

(iii) What are the weakness of simulation in this particular problem. [4 marks]

3. (a) Discuss any five queue disciplines that are used to control waiting lines. [10 marks]

(b) A commercial bank has an TM is town where customers can drive in and get service while in their vehicles. It is estimated that cars arrive according to a poison distribution at the rate of 2 cars in every five minutes. There is enough space to accommodate a line of 10 cars and other arriving cars can wait outside this space. It takes on average one and half minutes to serve a customer, but the service time actually varies according to an exponential distribution. If is assumed that the conditions of a single channel single phase queuing model will apply. Using this information, calculate [10 marks]

(i) The probability that the facility is idle

(ii) The average number of customers waiting for service

(iii) The average number of customers in the system

(iv) The average time a customer spends waiting for service

(v) The average time a customer spends in the system

4. (a) Discuss the solution procedure in solving transportation problems. [8 marks]

(b) A road construction company has three roads in a major town that are situated in the eastern, central and western parts of the town. Eastern requires 140 tons, Central requires 180 tons and Western requires 360 tons of ballast. The ballast is procured from firms A, B, C and D which can supply 100 tons, 160 tons 140 tons and 280 tons respectively. The construction company transports the ballast from any firm to any construction site. The transportation cost per ton (000) from each firm to be construction sites is as show in the table below

		Roads		
		Eastern	Central	Western
Firm	A	4	14	8
	B	6	6	2
	C	10	8	14
	D	2	12	14

Required:

(i) Formulate the problem as a transportation problem. [4 marks]

(ii) Using the least cost method (LCM), determine the minimum transportation cost. [8 marks]
