CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF COMMERCE

BCOM 361: OPERATIONS RESEARCH II

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

DAY/DATE: TUESDAY 03/12/2019   **11.30 AM – 1.30 PM**

INSTRUCTIONS:

Answer Question One and any other Two Questions

1.   (a)   Explain the steps that are followed in a Monte Carlo simulation process.

[10 marks]

   (b)   Discuss any five factors that lead to the replacement of assets in an organization.

[10 marks]

   (c)   A company manufactures two brands X and Y of the same product. The two brands compete for the same market. The marketing department is consultation with its engineering department has estimated the state transition matrix for the two brands to be.

	Brand X	Brand Y
Brand X	0.90	0.10
Brand Y	0.05	0.95

Initially the two brands share the available market equally. It is assumed that the assumptions of a first order markov process will apply.

Required:

   (i)   Which of the two brands appear to have more loyal customers? Explain.

[2 marks]

   (ii)   The market shares of the two products in the first two periods.   [3 marks]

(iii)   The market shares of the two products after a long period of time.   [5 marks]

2.   (a)   Ndagani Bank ltd intends to open an Automatic Teller Machine (ATM) in one of the busy streets of Ndagani market. The marketing department of the bank has projected the inter arrival times of customers at the ATM as follows:

Time between two consecutive arrival minutes	Probability
3	0.17
4	0.25
5	0.25
6	0.20
7	0.13

The ATM can serve customers at the following rate

Service time (minutes)	Probability
3	0.10
4	0.30
5	0.40
6	0.15
7	0.05

Some customers have complained that they waste a lot of time waiting for the service

Required:

(i)   Simulate the operation of this facility for a sample of ten customers using following the Random numbers: [6 marks]

24	57	77	68	64	88	98	48	93	84
23	94	83	97	83	93	33	49	37	22

(ii)   Using your results of simulation estimate the customers waiting time, service time and the ATMs idle time.   [4 marks]

(iii)   From your results advice management on the operation of the facility.
                                                                          [2 marks]

(b)   Using your results in question (a) above, give four limitations of using simulation process in decision making.   [8 marks]

3.   (a)   State and explain five assumptions of a single channel single phase queuing model with Poisson arrivals and exponential service times.   [10 marks]

(b)   A tailoring shop has only one tailor specialized in men's shirts. The number of customers arrivals follow a Poisson distribution with a mean arrival rate of 12 customers per hour. Customer are serv ed by the tailor on a first come first served basis and one willing to wait for service if there is a queue. The service time per customer differ from one to another depending on the type of service required. The average   customer service time is exponentially distribution at 4 minutes per customers.

Required:

(i)   The utilization parameter of the shop.   [2 marks]
(ii)   The probability that the system is idle.   [2 marks]
(iii)   The average number of customers in the system   [2 marks]
(iv)   The expected time that a customer spends in the system.   [2 marks]
(v)   The time that the tailor is free for a 10-hour working day.   [2 marks]

4.   (a)   Explain the term degeneracy as used in transportation process.   [5 marks]

(b)   Using suitable examples, distinguish between balanced and unbalanced transportation problems.   [5 marks]

(c)   Explain the term absorbing state as used in the markov analysis.   [5 marks]

(d)   Describe the goal programming technique in solving optimization problems.
                                                                   [5 marks]