KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2012/2021 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER

SUPPLIMENTARY/SPECIAL EXAMINATION

FOR THE DEGREE OF BACHELOR OF COMMERCE

COURSE CODE: BCO 222

COURSE TITLE: MANAGEMENT DECISION MODELS

DATE: 28/09/2021 **TIME: 11.00AM-13.00PM**

INSTRUCTION TO CANDIDATES

1) The paper contains **FIVE** questions
2) Attempt **THREE** questions
3) Question **ONE** is Compulsory
4) Show your work clearly.

TIME: 2 Hours

KIBU observes **ZERO** tolerance to examination cheating

QUESTION ONE

a) Giving examples explain the steps of the simulation method as used in Management Decision Models. (5 marks)
b) In Queuing theory the arrival pattern of the customers is not uniform. A manager who is interested in knowing the optimal number of servers must understand all the components in a queuing system. Explain these components and how they function and relate (5 marks).
c) Discuss the Assumptions of the Transportation Problem (5 marks)
d) A typical project must have certain characteristics. Discuss. (5 marks)
e) Work out this Linear Programming Problem using the graphical method (10 mks)

Minimize $C = 0.6X_1 + X_2$

Subject to;

$10X_1 + 4X_2 \geq 20$
$5X_1 + 5X_2 \geq 20$
$2X_1 + 6X_2 \geq 12$
$X_1 \geq 0\ X_2 \geq 0$

QUESTION TWO

Electrical Equipment Ltd is engaged in the production of power transformers and traction transformers. Both of these categories of transformers pass through three basic processes Viz core-preparation, core –to-coil assembly and processing (Vapour phase drying). The power transformer yields contribution of Kshs 10,000. The time required in terms of hours for each of the process is shown below.

	Power Transformers	Traction Transformers
Core-preparation	75	15
Core-to-coil Assembly	160	30
Vapour-phase drying	45	10

The capacity of the core-building shop, Assembly shop and Vapour Phase drying equipments are as under

Process	Available Capacity (HIS)
Core-preparation	1000
Core-to-coil Assembly	1500
Vapour –Phase drying	750

Required
Develop a linear programming Model for the above product to solve for maximization of Contribution using the Graphical Method. (20 marks)

QUESTION THREE

Kibabii Electricity Board has started a project for the improvement of the power supply in their region and have identified the following activities.

Name	Activity Description	Immediate Predecessor	Time Duration (weeks)
A.	SURVEY	-	12
B.	ESTIMATE AND SANCTION	A	4
C.	TREE CUTTING SCHEDULE	A	20
D.	STUBS AND TOWER PARTS	B	20
E.	AWARD CONTRACT FOR STUB	B	8
F.	AWARD CONTRACT FOR TOWER	B	8
G.	STUB SETTING FOR TOWERS	D,E	8
H.	TREE CUTTING	C	8
I.	TOWER ERECTION & STRINGING	F,G,H	12
J.	ENERGIZING	I	4

Required

a) Draw a suitable AOA network Diagram (10 marks)
b) Spell out your assumptions in designing this network (5 marks)
c) Find the estimated time to complete the transmission line project (5 marks)

QUESTION FOUR

Two companies Lamu Bread Ltd (LB) and Bungoma Bread Ltd (BB) were recently launched into the Kenyan Market to produce and sell maize/wheat bread (MW bread). No other companies produces and sells MW bread after operating for a while, it was deemed necessary to establish the market shares of the two companies in MW bread. For this purpose a sample of 6400 consumers consisting of equal numbers for each company was selected at the beginning of April 2017. Their loyalty shifting pattern was observed to the end of the month. For this kind of market it is expected that 75% consumers of LB will keep their loyalty to the company's bread while the rest will shift to the competitors. It is further expected that 50% consumers of BB will shift their loyalty to LB and the rest will remain loyal to BB at the end of the month.

a) What is the initial state in this problem (3 marks)
b) Construct the transition matrix for MW market. (5 marks)
c) Based on this information, how many of the sampled consumers of MW bread will be consuming each of the company's bread by the end of
   i. April 2017 (3 marks)
   ii. May 2017 (3 marks)
   iii. End of a month-long-to-come (4 marks)

Discuss the Assumptions of Markov Chains (5 marks)

QUESTION FIVE

Plans are being made for a plant enlargement. Repair facilities for machine breakdowns are barely adequate in the existing plant and will certainly not provide acceptable service when more machines are added. Records of recent repair activities show an average of four breakdowns per 8-hour shift. The pattern of breakdowns closely follows a poisson distribution. When the new additions to the plant are completed an average of six breakdowns per shift following the present distribution pattern is expected. An exponential distributed service rate of six repairs per shift is the capacity of the present repair facility.

Two alternatives with equivalent annual cost are available. New equipment and larger crew for the existing station would increase the average service rate to 11 repairs per shift or a second servicing station could be built in the new addition. In the latter alternative, the capacity of the two service stations would be five servicing per shift in each. Repairs times would still be exponentially distributed.

Required

Which of the two alternatives would be more efficient in terms of customer waiting time? (20 marks)

Queuing Characteristics.

1. Average Utilization Rate /probability that a service channel is busy/ traffic intensity.
   (Rho) $\rho = \lambda/\mu$
2. Expected no. of customers in the queuing system.
   $L_s = \lambda/(\mu - \lambda)$
3. Expected no. of customers in the queue.
   $L_q = \lambda^2/(\mu(\mu - \lambda))$
4. Expected time a customer spends in the queuing system.
   $W_s = 1/(\mu - \lambda)$
5. Expected time a customer spends in the queue.
   $W_q = \lambda/(\mu(\mu - \lambda))$
6. The probability of an empty or idle queuing system.
   $\rho_0 = 1 - (\lambda/\mu)$
7. The probability that there are 'n' customers in the queuing system.
   $\rho_n = 1 - (\lambda/\mu)^n (1 - \lambda/\mu)$
8. The probability of the queuing length being greater than or being equal to 'n'.
   $\rho(\geq n) = (\lambda/\mu)^n$