CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE

BCOM 263: OPERATIONS RESEARCH I

STREAMS: BCOM Y2S2 (ODEL) **TIME: 2 HOURS**

DAY/DATE: MONDAY 08/04/2024 **2.30 P.M – 4.30 P.M.**

INSTRUCTIONS:

- **Answer QUESTION ONE and any other TWO QUESTIONS.**
- **Do NOT write on the question paper.**

QUESTION ONE (30 MARKS)

(a) Operations Research uses models in solving problems. Discuss any five benefits of using models to solve business problems. (10 marks)

(b) Explain four benefits of using the reorder level system in managing inventories. (8 marks)

(c) Central and Eastern Industries in planning to introduce a new mobile phones service. To do so, the following activities are necessary.

Activity	Immediate Predecessor (s)	Completion Time (hours)
A	-	7
B	-	10
C	A	4
D	A	30
E	A	7
F	B,C	12
G	B,C	15
H	E,F	11
I	E,F	25
J	E,F	6
K	D,H	21
L	G,J	25

Required:

(i) Construct a network diagram for the project. (7 marks)

(ii) Determine the critical path and the project's expected completion time. (5 marks)

QUESTION TWO (20 MARKS)

(a) Explain the inherent limitations in the applicability of operation research among the Kenyan commercial enterprises. (10 marks)

(b) A construction company specializes in building and selling single and double bedroomed houses. A single bedroomed house requires 4000 labour hours, 2 tons of building stones and sand and 2000 feet of timber. A double bedroomed house require 10,000 labour hours, 3 tons of stones and sand and 2000 feet of timber. Due to long lead times for ordering supplies and scarcity of skilled labour in the construction area, the company will be forced to rely on its present resources. It had 400,000 hours of labour, 150 tons of stones and sand and 200,000 feet of timber. Each single bedroomed house yields a profit of 3000 shillings and each double bedroomed house sold yields 600 shillings. It is assumed that the company will sell all the houses it builds

Required:

(i) Formulate the problem as a linear programming problem. (7 marks)

(ii) Write the problem in standard form. (3 marks)

QUESTION THREE (20 MARKS)

(a) Explain the inherent assumptions on which linear programming models are formulated and solved. (10 marks)

(b) The John Equipment Company has several production outlets spread across different parts of the country but import its spare parts from China which are subsequently stored in a distribution warehouse located in Nairobi. The company estimates its carrying cost at 15% and the ordering cost at Sh. 9 per order. The estimated annual requirement is 48,000 units at a price of Sh. 4 per unit. The lead time is normally 30 days and the company operates for 360 days in a year.

Required:

(i) What is the most economical number of units to order? (3 marks)
(ii) How many orders should be placed in a year? (2 marks)
(iii) Reorder level for the company (2 marks)
(iv) Total inventory cost (3 marks)

QUESTION FOUR (20 MARKS)

(a) Discuss the basic rules and guidelines that a project manager need to adhere to while constructing a network diagram. (10 marks)

(b) A plant manager has 4 subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. Below are the estimates of the times each subordinate would take to perform each task.

	Subordinates			
Activities	P	Q	R	S
A	18	36	27	21
B	23	38	14	36
C	48	29	28	25
D	29	36	34	20

Required:

Assign each of the subordinates, jobs so as to minimize the total costs of performing the jobs and hence determine the minimum cost. (10 marks)
