CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF ECONOMICS AND STATISTICS AND BACHELOR OF ECONOMICS AND SOCIOLOGY

ECON 431/438: OPERATIONS RESEARCH

STREAMS: Y4S1   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 23/09/2021   **11.30 A.M – 1.30 P.M.**

INSTRUCTIONS:
- **Answer question ONE and any other TWO questions.**

1.   (a)   Discuss any five benefits using Operations Research techniques to solve business problems.   (10 marks)

       (b)   The implementation of the operations research recommendations are never or are slowly done in Kenya. Give five reasons to explain this.   (10 marks)

       (c)   The following information relations to the various activities and the time estimates for developing a new product.

Activity	Description	Preceding Activity	Duration in months
A	Product design	-	5
B	Market Research	-	2
C	Product Analysis	B,C	4
D	Product Model	A	6
E	Product Branding	A	8
F	Cost Analysis	C	6
G	Product Testing	D	8
H	Sales Training	B,E	3
I	Pricing	H	2
J	Product Launch	F,G,I	2

Required

(i)   Draw a network diagram for the project.   (5 marks)

(ii)   Determine the critical path and project duration.   (5 marks)

2. (a) Discuss the steps that are followed when solving assignment problems using the Hungarian method.   (8 marks)

(b) A company has four plants namely A, B, C and D and manufactures four products $P_1, P_2 P_3 \wedge P_4$. Each of the plants can manufacture any of the four products. The following data relates to the profitability of the plants in millions of shillings:

| PLANTS | ANNUAL PROFITABILITY (In Millions) | | | |
	P_1	P_2	P_3	P_4
A	211	218	214	211
B	215	217	216	215
C	213	215	214	212
D	213	211	216	213

Required

Assign each plant one product to manufacture in an optimal manner.   (12 marks)

3. (a) Discuss any five benefits of good inventory management practices. (10 marks)

(b) The following data relates to the usage of item X_{30} in its production process.

Normal Usage   1100 items per day
Minimum Usage   500 items per day
Maximum Usage   1400 items per day
Lead Time   25-30 days
Economic Order Quantity   50,000 items

Required. Using the above data, calculate,

(i)   Reorder Level
(ii)   Minimum Stock Level
(iii) Maximum Stcok Level
(iv)   Average Stock Level   (10 marks)

4. (a) Discuss the requirements that are necessary in using the linear programming technique to solve problems.   (5 marks)

(b)   The following linear programming problem was formulated by business students:

Minimize $Z = 20 x_1 + 40 x_2$

Subject to the following constraints:
$36 x_1 + 6 x_2 > 108$

$3 x_1 + 12 x_2 > 36$

$20 x_1 + 10 x_2 > 100$

$x_1, x_2 > 0$

(i)   Write the problem in standard form   (4 marks)

(ii)   Draw a graph of this problem and show the feasible region.   (7 marks)

(iii)   Give any four limitations of using the graphical method in solving linear programming problems.   (4 marks)