



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN (ELECTRICAL & ELECTRONICS ENGINEERING)

SCE 433: OPERATIONS RESEARCH

DATE: Wednesday, 24th November, 2010 TIME: 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS: Answer question ONE and any other TWO questions.

Question 1 (30 Marks)

- a) (i) What are the essential features of OR approach?.....(4 Marks)
- (ii) How does OR assist management in decision making?.....(3 Marks)
- (iii) What are the stages in an OR study?.....(3 Marks)
- b) Use graphical method to determine the range of optimality $\frac{C_1}{C_2}$ or $\frac{C_2}{C_1}$ for the following model.
(Observe the special cases where C_1 or C_2 may assume a zero value)
.....(5 Marks)

$$\begin{aligned} \text{Maximize } Z &= x_1 + 2x_2 \\ \text{Subject } -x_1 + 2x_2 &\geq 0 \\ 3x_1 + 2x_2 &\leq 10 \\ -x_1 + x_2 &\leq 1 \\ 1 \leq x_1 \leq 30, 0 \leq x_2 \leq 1 \end{aligned}$$

- c) Use simplex method to find the optimal solution to the model.....(5 Marks)

$$\begin{aligned} \text{Maximize } z &= 8x_1 + 5x_2 + 10x_3 \\ \text{Subject to } 2x_1 + 3x_2 + x_3 &\leq 400 \\ x_1 + x_3 &\leq 150 \\ 2x_1 + 4x_3 &\leq 200 \\ x_2 &\leq 50 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- d) Baba Canning is contracted to receive 60,000kg of ripe tomatoes at 7 cents per kg from which it produces both canned tomato juice and tomato paste. The canned products are packed in 24-can cases. A can of juice uses 1 kg of fresh tomatoes, and a can of paste uses 1/3 Kg only. The wholesale prices per case of juice and paste are \$18 and \$19 respectively.

- (i) Develop an optimum production program for Ban Canning Company. (5 Marks)
- (ii) Determine the price ratio of juice to paste that will allow Baba to produce more cases of juice than of paste.....(5 Marks)

Question 2 (20 marks)

A firm has three shops with a total of 80 televisions. An order is received from the local authority for 70 sets to be delivered to 4 schools. The transport costs from shops to schools are shown below together with the availabilities and requirements.

		Schools				
		A	B	C	D	
	Sets	20	30	15	5	Requirements
Available	Shop I	2	4	1	6	Costs
	Shop II	4	3	3	3	
	Shop III	1	2	5	2	

It is required to make the most economic deliveries

Set up the initial table and make the initial feasible deliveries..... (5 Marks)

Work out the shadow prices for the tableau above (15 Marks)

Question 3 (20 Marks)

- a) Find the critical path of the following network using the EST/LST

(10 mark)

Activity	Preceding Activity	Duration (days)
1	-	4
2	1	7
3	1	5
4	1	6
5	2	2
6	3	3
7	5	5
8	2,6	11
9	7,8	7
10	3	4
11	4	3
12	9,10,11	4

- b) Calculate the float of the network in part (a) (10 marks)
- c) The standard deviations of the activities on the critical path in part (a) are 1.2, 1.3, 3, 2.5 and 3 respectively. Based on these values calculate the probability of achieving a scheduled time of 40 days for the project duration.

Question 4 (20 Marks)

A firm has developed a new product X. They can either test the market or abandon the project. The details are set out below:

Test market cost £50,000; likely outcomes are favourable ($p=0.7$) or failure ($P=0.3$). If favourable they could either abandon or produce it when demand is anticipated to be:

Low	$p=0.25$	Loss £100,000
Medium	$p=0.60$	Profit £ 150,000
High	$p=0.15$	Profit £ 450,000

If the test market indicates failure the project would be abandoned. Abandonment at any stage results in a gain of £30,000 from the special machinery used.

- a) Draw the decision tree showing the modes and probabilities. (10 marks)
- b) Evaluate the decision tree in part (a) (10 marks)

QUESTION 5 (20 Marks)

- a) Explain the following term.....(8marks)
- strategy
 - Zero-sum game
 - Pay off matrix
 - Maxim –minimax principle

Solve the following game by linear programming(12 marks)

	B1	B2	B3
A1	3	-1	-3
A2	-2	4	-1
A3	-5	-6	2

NB: The value of the game, v , lies between -2 and 2