



UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF COMMERCE,

DMS 311: OPERATIONS RESEARCH FOR MANAGEMENT I

DATE: APRIL 9, 2018

TIME: 2:00 PM – 4:00 PM

INSTRUCTIONS:

Answer Question ONE and ANY other two Questions

QUESTION ONE (30 MARKS)

- a) Explain the steps for solving transportation linear programming problems using the North West Corner method (5 marks)

b)

- i) Define a linear program problems in standard form (1 mark)
ii) Given a linear program problem:

$$\text{Maximize: } Z=30x_1 + 20x_2+ 40x_3$$

$$\text{Subject to: } x_1 + x_2 + x_3 \leq 50$$

$$2x_1 + x_3 \leq 80$$

$$x_1 + 2x_2 + 5x_3 \leq 90$$

write this linear problem into standard form of linear program (3 marks)

- iii) Hence state: $\underline{X}^T=(\dots\dots\dots)$, $\underline{C}^T=(\dots\dots\dots)$, $\underline{X}^T_B=(\dots\dots\dots)$

$$\underline{C}^T_B=(\dots\dots\dots), \underline{b}=(\dots\dots\dots), \text{Matrix } A=(\dots\dots\dots)$$

(3 marks)



- c) Explain the characteristics of Operations Research problems (5marks)
- d) Give a brief description of decision Analysis for Management Judgment (5 marks)
- e) Explain the arrival characteristics of poisson distribution for random arrivals (4marks)
- f) Explain any four types of Inventory holding costs for management (4marks)

QUESTION TWO (20 MARKS)

- a) Illustrate and explain the decision analysis process for management (6marks)
- b) Illustrate and describe network analysis for project planning (10marks)
- c) Explain the functions of assignment models (4 marks)

QUESTION THREE (20 MARKS)

- a)
 - i) Explain the characteristics of a transportation model (4 marks)
 - ii) A company has three factories A, B and C which supply warehouse at D,E and F. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements (demands) are 180, 120 and 150 units respectively. Unit shipping cost are illustrated in the table below.

Factory	D	E	F
A	16	20	12
B	14	8	18
C	26	24	16

- Determine the optimal allocation of goods to be transported from each factory to specific warehouse (12 marks)
 - iii) Calculate the optimal transportation cost for these goods to the warehouse (2 marks)
 - iv) Explain your final allocation of goods as determined in (ii) (2 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the following elements in queueing systems
 - i) A customer (2 marks)
 - ii) A server (2 marks)
 - iii) Queue discipline (2 marks)
- b) Explain how queue performance are measured (4 marks)
- c) A beverage company has a soft drink product that has a constant annual demand rate of 3600 cases. A case of the soft drink costs \$3. Ordering costs are \$20 per order and holding costs are 25% of the value of the inventory. The company has 250 working days per year, and the lead time is 5 days. Calculate:
 - i) Economic order quantity (4 marks)
 - ii) Reorder point (3 marks)
 - iii) Cycle time (3 marks)

QUESTION FIVE (20 MARKS)

- a) Demonstrate the difference between Slack and Surplus variable of linear programming (4 marks)
- b) Outline the algorithms steps for solving linear programming problem by simplex method (8 marks)
- c) A manufacturer produces three products x_1 , x_2 and x_3 . The manufacturer wishes to establish the number of each variables (x_1 , x_2 and x_3) the company can produce weekly to maximize weekly profit. To determine the value of x_1 , x_2 and x_3 the company uses the following inequalities:

Maximize; $P = 2x_1 - x_2 + 2x_3$

Subject to the constraints

$$x_1 + x_2 \leq 10$$

$$x_1 + 2x_2 - 2x_3 \leq 20$$

$$x_2 + 2x_3 \leq 5$$

- i) Use simplex method to determine the values of x_1 , x_2 and x_3 (6 marks)
- ii) Hence find the maximum weekly profit (2 marks)

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