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Page 1 of 3

UNIVERSITY OF ESWATINI

FINAL EXAMINATION PAPER

PROGRAMME: BSC. IN AGRICULTURAL ECONOMICS AND AGRIBUSINESS
MANAGEMENT YEAR II

COURSE CODE: AEM 206

TITLE OF PAPER: QUANTITATIVE METHODS FOR AGRIBUSINESS
DECISIONS

TIME ALLOWED: 2: 00 HOURS

INSTRUCTION: 1. ANSWER ALL FOUR QUESTIONS
2. EACH QUESTION CARRIES 25 POINTS

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Question 1.(25 points)

Answer the following questions

- A. What do you mean by linear programming? (5 points)
- B. What are the properties of linear programming? (5 points)
- C. List the basic assumptions of linear programming? (5 points)
- D. What is a slack variable in linear programming? (5 points)
- E. What is the shadow price in linear programming? (5 points)

Question 2 (25 points)

Part A.(10 points)

A firm manufactures three products A ,B and C, the market for each being virtually unlimited. Each product is processed on each of the machines I, II and III. The processing times in hours per item of A ,B and C on each machine are given in the table.

	A	B	C	Resource's
I	3	4	1	110
II	2	3	2	226
III	7	9	3	444

The available production time of the machines I ,II and III is 110 hours,226 hours and 444 hours respectively each week. The profit per item of A, B and C is E4 ,E 9 and E5 respectively.

The firm wishes to determine the weekly production of items of A B and C which will maximize its profit. Formulate this problem as a linear programming problem only.

Part B (15 points)

Consider the problem

Maximize $Z = 40x + 50y,$
 Subject to $2x + 6y \leq 36$ Constraint 1
 $5x + 3y \leq 30$ Constraint 2
 $8x + 2y \leq 40$ Constraint 3
 And $x \geq 0, y \geq 0.$

Solve the above linear programming problem using graphical method.

Question 3.(25 points)

3.1 A company has three departments producing a certain product that is to be shipped to four distribution centers. Department 1,2 and 3 produce 16,24 and 20 shipments per month, respectively. Each distribution center needs to receive 15 shipments per month. The distance from each plant to the respective distributing centers is given in miles:

	1	2	3	4
Plant 1	300	600	400	700
Plant 2	400	200	100	950
Plant 3	500	550	200	700

The freight cost for each shipment is E100 per mile.

The company wishes to determine how much should be shipped from each plant to each of the distribution centers to minimize the total shipping costs.

- A) Formulate this problem as a transportation problem by constructing the appropriate cost and requirements table.
- B) Use the northwest corner rule to obtain an initial basic feasible solution.(12 points)

3.2 A firm's annual inventory is 1,600 units. The cost of placing an order is R 50, purchase price of raw material/unit is R10 and the carrying costs is expected to be 10% per unit p.a. Calculate EOQ? (13 points)

Question 4.(25 points)

4.1 Three air conditioners need to be installed in the same week by three different companies .Bids for each job are solicited from each company as shown in the table below.

	Bid1	Bid2	Bid3
A	33	56	67
B	53	66	71
C	70	82	86

To which company should each job be assigned to minimize the cost?

(First reformulate as equivalent assignment problem and Use Hungarian Algorithm)
(13 points)

4.2 The demand for a product is 600 units per week, and the items are with drawn at a constant rate. The setup cost for placing an order to replenish inventory is E25. The unit cost of each item is E3, and the inventory holding cost is E0.05 per item per week.

Assuming shortages are not allowed, determine how often to order and what size the order should be.
(12 points)

END OF PAPER