

American College of Technology
Master of Business Administration
Assignment ONE for Quantitative Methods for
Decision Making

Instruction: Solve the Following Questions

1. Old hens can be bought for Birr 2 each but young ones costs Birr 5 each. The old hens lay 3 eggs per week and the young ones lay 5 eggs per week. Each egg costs Birr 0.30. A hen costs Birr 1 per week to feed. If the financial constraint is to spend Birr 80 per week for hens and the capacity constraint is that total number of hens cannot exceed 20 hens and the objective is to earn a profit more than Birr 6 per week, find the optimal combination of hens.

Required:

- A. Formulate the given problem as Linear Programming Model. **(2 points)**
 - B. Solve the LPP using the Graphical Method and interpret the result. **(3 points)**
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2. The ABC Corporation has decided to produce three new products. Five branch plants now have excess product capacity. The unit transportation cost of the first product would be BIRR 31, BIRR 29, BIRR 32, BIRR 28, and BIRR 29 in Plants 1, 2, 3, 4, and 5, respectively. The unit transportation cost of the second product would be BIRR 45, BIRR 41, BIRR 46, BIRR 42, and BIRR 43 in Plants 1, 2, 3, 4, and 5, respectively. The unit transportation cost of the third product would be BIRR 38, BIRR 35, and BIRR 40 in Plants 1, 2, and 3, respectively, whereas Plants 4 and 5 do not have the capability for transporting this product. Sales forecasts indicate that 600, 1,000, and 800 units of products 1, 2, and 3, respectively, should be produced per day. Plants 1, 2, 3, 4, and 5 have the capacity to produce 200, 600, 200, 600, and 800 units daily, respectively, regardless of the product or combination of products involved.
Assume that any plant having the capability and capacity to produce them can produce any combination of the products in any quantity. Management wishes to know how to allocate the new products to the plants to minimize total transportation cost.

Required:

- i. Formulate this problem as a *transportation problem* by constructing the appropriate parameter table. **(3 Points)**
- ii. Obtain an initial basic feasible solution by using
 - A. The North West Corner Rule Method. **(3 Points)**
 - B. The Least Cost Method. **(3 Points)**
 - C. The Vogel's Approximation Method. **(3 Points)**
3. Assume that you are manager of XYZ Company and you have to allocate four different jobs to four employees that are under your supervision. Depending on the efficiency and the capacity of the individual, the hours taken by each employee is different as shown in the following table. How the tasks should be assigned to each employee so as to minimize the total man-hours? **(8 points)**

<i>Job</i>	<i>Employees</i>			
	<i>Abebe</i>	<i>Belete</i>	<i>Chala</i>	<i>Dawit</i>
<i>1</i>	60	70	68	64
<i>2</i>	65	75	59	75
<i>3</i>	80	69	67	62
<i>4</i>	69	74	70	60

4. Solve the following linear programming model using the ***Simplex Algorithm*** and interpret your result. **(5 points)**

$$\text{Max. } Z = 300x_1 + 250x_2$$

Subject to:

$$2x_1 + x_2 \leq 40$$

$$x_1 + 3x_2 \leq 45$$

$$x_1 \leq 12$$

$$x_1, x_2 \geq 0$$

5.