Internal Assessment 2

Each question carries 5 marks.

1. Three electric power plants with capacities of 25, 40 and 30 million kWh supply electricity to three cities. The maximum demands at the three cities are estimated at 30, 35 and 25 million kWh. The price per million kWh at the three cities is given in table.

Price/Million kWh

		City		
		1	2	3
	1	$600	$700	$400
Plant	2	$320	$300	$350
	3	$500	$480	$450

During the month of august, there is a 20% increase in demand at each of the three cities, which can be met by purchasing electricity from another network at a premium rate of $1000 per million kWh. The network is not linked to city 3, however. The utility company wishes to determine the most economical plan for the distribution and purchase of additional energy.

b is $30 + 20 = 50$ m

(a) Formulate the problem as a transportation modal.
(b) Determine an optimal distribution plan for the utility company.
(c) Determine the cost of the additional power purchased by each of the three cities.
(d) Solve the problem, assuming that there is a 10% power transmission loss through the network.

2. A business executive must make the four round-trips listed in table (given below) between the head office in Dallas and a branch office in Atlanta.

The price of a round-trip ticket from Dallas is $400. A 25% discount is granted if the dates of arrival and departure of a ticket span a weekend (Saturday and Sunday). If the stay in Atlanta lasts more than 21 days, the discount is increased to 30%. A one-way ticket between Dallas and Atlanta (either direction) costs $250. How should the executive purchase the tickets?

Departure date from Dallas	Return date to Dallas
Monday, June 3	Friday, June 7
Monday, June 10	Wednesday, June 12
Monday, June 17	Friday, June 21
Tuesday, June 25	Friday, June 28

3. An owner wants to assign four different categories of machines to five tasks of production. The numbers of machines available in the four categories are 25, 30, 20, and 30. The numbers of jobs in the five tasks are 30, 10, 20, 25, and 20. Machine category 4 cannot be assigned to task type 4. Table (given below) provides the unit cost of assigning a machine to a task type. Determine the optimum number of machines in each category to be assigned to each task type and interpret the solution.

		Task type				
		1	2	3	4	5
Machine category	1	10	2	3	15	9
	2	5	10	15	2	4
	3	15	5	14	7	15
	4	20	15	13	–	8

4. Solve the following LPP modal using branch & bound method

$$\text{Maximize } z = 3x_1 + 13x_2$$
$$\text{subject to } 2x_1 + 9x_2 \leq 40$$
$$11x_1 - 8x_2 \leq 82$$
$$x_1, x_2 \geq 0 \text{ and integers}$$