Date: 29ᵗʰ August 2013
Time: 08:00 – 09:00 AM

NOTE:

1. CELL PHONE NOT ALLOWED EVEN IN SWITCHED OFF MODE. KEEP IT AWAY FROM YOU EITHER IN YOUR BAG OR HAND IT OVER TO THE INVIGILATOR DUIRING EXAMINATION.

2. USE YOUR OWN CALCULATOR. EXCAHNGE OF CALCULATORS IS NOT ALLOWED.

1. A subsidiary company of Reliance Petro Chemicals near Jamnagar transports diesel to its distributors by truck. The company recently contracted to supply diesel distributors in southern states and it has Rs 36 milliion (Rs 3.6 crore) available to spend on necessary expansion of its fleet of diesel tank trucks. Three models of diesel tank trucks are available.

Truck model	Capacity (litres)	Purchase cost	Monthly operating cost including depreciation
Super Tanker	30,000	Rs 4.2 million	36,000
Regular Line	15,000	Rs 3.3 million	27,000
Econo-Tanker	6,000	Rs 2.7 million	22,800

The company estimates that the monthly demand for the region will be 33 million litres of diesel. Because of the size and speed differences of the trucks, the nukber of deliveries or round trips possible per month for each truck model will vary. Trip capacities are estimated at 15 trips per month for the Super Tanker, 20 trips per month for the Regular Line, and 25 trips per month for Econo-Ranker. Based on maintenance and driver availability, the firm does not want to add more than 15 new vehicles for the fleet. In addition, the company has decided to purchase at least three of the new Econo-Tankers for use for short-run, low-demand routes. As a final constraint, the company does not want more than half the new models to be Super Tankers.

Formulate the problems for the following constraint.

(a) If the company wishes to satisfy the diesel demand with the minimum monthly operating expenses.

(b) If the company did not require at least three Econo-Tankers and did not limit the number of Super Tankers to at most half the new models.

$$2 \times 2\frac{1}{2} = 5 \text{ mar}$$

2. Show the first two iterations in the bounded-variable algorithm of the following LP problem.

Maximise $9 x_1 + 1 x_2 - 15 x_3 - 5 x_4$

Subject to $-3 x_1 + 2 x_2 + 9 x_3 + 1 x_4 \leq 7$

$\qquad\qquad 6 x_1 + 16 x_2 - 12 x_3 - 2 x_4 \leq 10$

$\qquad\qquad 0 \leq x_j \leq 1$ for $j = 1, 2, 3, 4$.

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