Class test 2: Operations Research 2017-18 (Spring)

Question 1 [1+1+2+2]

A company Candyco can manufacture three types of candy bar using sugar and chocolate. If x_j be the number of Type j candy bars manufactured, the company should solve the following LP:

$$\text{Max } Z = 3x_1 + 7x_2 + 5x_3$$

$x_1 + x_2 + x_3 \leq 50$ (Sugar constraint)

$2x_1 + 3x_2 + x_3 \leq 100$ (Chocolate constraint) $\qquad x_1, x_2, x_3 \geq 0$

After adding slack variables x_4 and x_5 for the respective constraints, the simplex method yields the following final set of equations:

$$Z + 3x_1 + 4x_4 + x_5 = 300$$

$$\frac{1}{2}x_1 + x_3 + \frac{3}{2}x_4 - \frac{1}{2}x_5 = 25$$

$$\frac{1}{2}x_1 + x_2 - \frac{1}{2}x_4 + \frac{1}{2}x_5 = 25$$

Using the above final set of equations, answer the following questions (extend the simplex/dual simplex method if required):

(a) For what values of Type 1 candy bar profit does the current basis remain optimal?

(b) For what amount of available sugar would the current basis remain optimal?

(c) If 30 ounce of sugar were available, how many of each candy bar should the company make?

(d) Candyco is considering making Type 4 candy bars. Type 4 candy bar earns Rs 17 profit per unit and requires 3 ounce of sugar and 4 ounce of chocolate. Find the new optimal solution.

Question 2 [1.5+2.5]

In the light of the recent ban on Rs. 500 and Rs. 1000 notes, Reserve Bank of India (RBI) plans a model of supplying new notes of Rs. 2000 denomination to its four regional offices located at Delhi, Mumbai, Kolkata and Chennai from its two printing presses located at Mysore and Nasik. The transportation cost (in Rupees) per note is given in the Table. Supply and demand are expressed in number of notes per day.

RBI wants to minimize the total transportation cost per day. Use Vogel's Approximation Method to find an initial basic feasible solution and apply transportation Simplex method to obtain the optimal solution. Which city (or cities) will fall short of supply and by how much?

	Delhi	Mumbai	Kolkata	Chennai	Supply
Mysore	20	6	17	5	5000
Nasik	12	2	18	16	5000
Demand	3000	3000	3000	3000	