QUESTÃO 1)

Dado o primal, formule o dual e resolva o problema obtendo suas soluções ótimas.

$$\begin{aligned} \max \quad & Z = 2x_1 + 1x_2 \\ sa \quad & 3x_1 + 4x_2 \le 6 \\ & 6x_1 + 1x_2 \le 3 \\ & x_1, x_2 \ge 0 \end{aligned}$$

QUESTÃO 2)

Dado o dual, formule o primal e resolva o problema obtendo duas soluções ótimas.

$$\begin{aligned} \min \ D = \quad & 3y_1 + 4y_2 + 9y_3 \\ sa \quad & 1y_1 + 0y_2 + 1y_3 \ge 5 \\ & 0y_1 + 1y_2 + 2y_3 \ge 2 \\ & y_1, y_2 \ge 0 \\ & y_3 \le 0 \end{aligned}$$

QUESTÃO 3)

Sabe-se que $x_1 = 4$ e $x_2 = 1$ é uma solução viável para o problema dado abaixo. Verifique se essa solução é ótima através do teorema da folga complementar.

$$\begin{array}{lrcrcl} \max & x_1 & - & x_2 & & \\ \text{subject to} & -2x_1 & + & x_2 & \le & 2 \\ & x_1 & - & 2x_2 & \le & 2 \\ & x_1 & + & x_2 & \le & 5 \\ & & & x & \ge & 0 \end{array}$$

.

QUESTÃO 4)

Consider the linear programming problem

$$\begin{array}{l} \text{Maximize } z = 5x_1 + 10x_2 \\ \text{subject to} \\ \begin{array}{rcrcl} x_1 & + & 3x_2 & \le & 50 \\ 4x_1 & + & 2x_2 & \le & 60 \\ x_1 & & & \le & 5 \\ x_1, & & x_2 & \ge & 0 \end{array} \end{array}$$

(a) State the dual of the preceding LPP.

(b) Given that $(5, 15)$ is an optimal solution to this LPP, use the Duality Theorem and the principle of complementary slackness to find optimal solution to the dual.

QUESTÃO 5)

Example 6.1-14. *A company manufactures three products : tables, chairs and racks. The resource utilisation, resource availability and profit/unit of each product are given below :*

TABLE 6.18

Product	*Resource Requirement*			*Profit / unit (Rs.)*
	Timber (cubic feet)	*Time in manufacturing department (hours)*	*Time in finishing department (hours)*	
Table	*10*	*7*	*2*	*12*
Chair	*2*	*3*	*4*	*3*
Rack	*1*	*2*	*1*	*1*
Available	*100*	*77*	*80*	

(i) Formulate it as a linear programming problem.
(ii) Write its dual.
(iii) Find the optimal solution to the given problem.
(iv) From the final optimal table, find the solution to the dual problem.
(v) What are the shadow prices of the resources?
(vi) Give economic interpretation of the dual problem.

QUESTÃO 6)

Example 6.2-2. *Use dual simplex method to*

maximize $Z = -3x_1 - 2x_2,$

subject to
$$x_1 + x_2 \geq 1,$$
$$x_1 + x_2 \leq 7,$$
$$x_1 + 2x_2 \geq 10,$$
$$x_2 \leq 3,$$
$$x_1, x_2, \geq 0.$$

[M.D.U. Rohtak B.E. (Mech.) Dec., 2006; H.P.U. MCA 1999, Delhi M.Sc. (Math.) 1972

QUESTÃO 7)

Example 6.2-4. *Use dual simplex method to solve the following L.P. problem :*

Minimize $Z = 3x_1 + 2x_2 + x_3 + 4x_4,$

subject to
$$2x_1 + 4x_2 + 5x_3 + x_4 \geq 10,$$
$$3x_1 - x_2 + 7x_3 - 2x_4 \geq 2,$$
$$5x_1 + 2x_2 + x_3 + 6x_4 \geq 15,$$
$$x_1, x_2, x_3, x_4 \geq 0.$$

[Meerut M.Sc. (Math.) 1974]