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GOODLUCK Page No. 6
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Assignment No. 3

[Solution of LPP by simplex method]

Que. A hotel owner sells 2-dishes, chicken and fish. For making 1 plate chicken- 2 masala packets, (1/2) packet of salt, (1/2) packet of garlic pest & 0.4 litre of water is required. Where as for making 1-plate of fish- 1 masala packet, (4/10) packet of salt, (1/2) packet garlic pest & 0.5 litre water is required. But due to some unfortunate condition he only has 6-masala packets, 2-packets of salt, 2 litre water, 2 packet garlic pest, 1 kg chicken & 0.5 kg fish. Hotel owner makes profit of ₹40 on each chicken plate & ₹35 on each fish plate. In order to maximize profit, how much quantity of both dishes, he should make? Solve by simplex method. [1 plate = 200 gram]

→ Sol^n :-

Let $x \Rightarrow$ No. of chicken plates

$y \Rightarrow$ No. of fish plates,

∴ From given data,

objective function is

$$Z = 40x + 35y$$

& constraints are,

$$2x + y \le 6$$
$$0.2x + 0.4y \le 2$$
$$0.5x + 0.5y \le 2$$
$$0.4x + 0.5y \le 2$$
$$0.2x \le 1$$
$$0.2y \le 0.5$$
$$x, y, \ge 0$$

∴ Adding slack variables & converting inequalities into equality,

$$2x+y+s_1=6$$
$$0.2x+0.4y+s_2=2$$
$$0.5x+0.5y+s_3=2$$
$$0.4x+0.5y+s_4=2$$
$$0.2x+s_5=1$$
$$0.2y+s_6=0.5$$
$$x,y \geq 0 \ \& \ s_1,s_2,s_3,s_4,s_5,s_6 \geq 0$$

Modified objective function is,

$$z=40x+35y+0s_1+0s_2+0s_3+0s_4+0s_5+0s_6.$$

Solving by simplex method,

Itr-1

			40	35	0	0	0	0	0	0
C_B	x_B	x_{Bi}	x	y	s_1	s_2	s_3	s_4	s_5	s_6
0	s_1	6	2#	1	1	0	0	0	0	0 ⇐
0	s_2	2	0.2	0.4	0	1	0	0	0	0
0	s_3	2	0.5	0.5	0	0	1	0	0	0
0	s_4	2	0.4	0.5	0	0	0	1	0	0
0	s_5	1	0.2	0	0	0	0	0	1	0
0	s_6	0.5	0	0.2	0	0	0	0	0	1
	z_j	0	0	0	0	0	0	0	0	0
	z_j-c_j	0	-40	-35	0	0	0	0	0	0

⇑
Key column

Here key column is corresponding to variable x_1 & key row is corr. to variable s_1

$\therefore$ key element = 2

Applying simplex algorithm we get,

Iteration 2,

			40	35	0	0	0	0	0	0
C_B	X_B	X_{B_i}	x_1	x_2	s_1	s_2	s_3	s_4	s_5	s_6
40	x_1	3	1	0.5	0.5	0	0	0	0	0
0	s_2	1.4	0	0.3	-0.1	1	0	0	0	0
0	s_3	0.5	0	0.25	-0.25	0	1	0	0	0 ⇐
0	s_4	0.8	0	0.3	-0.2	0	0	1	0	0
0	s_5	6.4	0	-0.1	-0.1	0	0	0	1	0
0	s_6	0.5	0	0.2	0	0	0	0	0	1
	z_j	120	40	20	20	0	0	0	0	0
	$z_j - c_j$		0	-15	20	0	0	0	0	0

⇑ key column.

Again applying simplex algorithm.

Iteration 3

			40	35	0	0	0	0	0	0
C_B	X_B	X_{B_i}	x_1	x_2	s_1	s_2	s_3	s_4	s_5	s_6
40	x_1	2	1	0	1	0	-2	0	0	0
0	s_2	0.8	0	0	0.2	1	-1.2	0	0	0
35	x_2	2	0	1	-1	0	4	0	0	0
0	s_4	0.2	0	0	0.1	0	-1.2	0	0	0
0	s_5	0.6	0	0	-0.2	0	0.4	1	1	0
0	s_6	0.1	0	0	0.2	0	-0.8	0	0	1
	z_j	150	40	35	5	0	60	0	0	0
	$z_j - c_j$		0	0	5	0	60	0	0	0

Since all $z_j - c_j \geq 0$

Hence optimal solution is reached.

$\Rightarrow$ optimum sol^n is $\boxed{x = 2,\ y = 2}$

& optimum value is $\boxed{z = 150}$.