190031187 **NERELLA VENKATA RADHAKRISHNA**

MP-1 HOME ASSIGNMENT-2

1.Find the solution of dual problem of LPP
Max Z=5x_1+3x_2
Subject to the constraints x_1+ x_2 <= 2, 5x_1+2x_2<=10, 3x_1+8x_2 <= 12 x_1,x_2 >=0

190031187

Home Assigment

N.V. Radhakrishna

1. Max $z = 5x_1 + 3x_2$

Subject To $x_1 + x_2 <= 2$

$5x_1 + 2x_2 <= 10$

$3x_1 + 8x_2 <= 12$

$x_1, x_2 >= 0$

The given problem is already in standard primal LPP.

Converting the primal into it's dual

$$\text{Min } z' = 2w_1 + 10w_2 + 12w_3$$

subject To

$$1w_1 + 5w_2 + 3w_3 \geq 5$$
$$1w_1 + 2w_2 + 8w_3 \geq 3$$

and $w_1, w_2, w_3 \geq 0$

Solution using primal (given LPP)

By introducing the slack variables s_1, s_2, s_3 the problem in standard form becomes:

$$\text{Max } z = 5x_1 + 3x_2 + 0s_1 + 0s_2 + 0s_3$$

subject To:

$$x_1 + x_2 + s_1 + 0s_2 + 0s_3 = 2$$
$$5x_1 + 2x_2 + 0s_2 + s_2 + 0s_3 = 10$$
$$3x_1 + 8x_2 + 0s_1 + 0s_2 + s_3 = 12$$
$$x_1, x_2, \quad , s_1, s_2, s_3 \geq 0$$

C_{B_i}	C_j	5	3	0	0	0		
	B.V	x_1	x_2	s_1	s_2	s_3	sol	Ratio
0	s_1	1	1	1	0	0	2	2
0	s_2	5	2	0	1	0	10	2
0	s_3	3	8	0	0	1	12	4
	z_j	0	0	0	0	0		
	$c_j - z_j$	5	3	0	0	0		

Leaving = s_1
Entering = x_1
key element = 1

Iteration - 1

C_{B_i}	C_j	5	3	0	0	0	
	B.V	x_1	x_2	s_1	s_2	s_3	sol
5	x_1	1	1	1	0	0	2
0	s_1	0	-3	-5	1	0	0
0	s_3	0	5	-3	0	1	6
	z_j	5	5	5	0	0	
	$c_j - z_j$	0	-2	-5	0	0	

Hence optimal solution is arrived with value of variables as:

$x_1 = 2 \quad x_2 = 0$

Max $z = 10$

Dual problem

Min $z' = 2w_1 + 10w_2 + 12w_3$

subject To :

$w_1 + 5w_2 + 3w_3 \geq 5$

$w_1 + 2w_2 + 8w_3 \geq 3$

$w_1, w_2, w_3 \geq 0$

solution of dual problem using primal LPP solution using z_j row corresponding to s_1, s_2, s_3 are 5,0,0 gives values for y_1, y_2, y_3 respectiv-ly. and optimum value for z & z' same

Min $z' = 10$

2. Find the solution for Dual problem:
Min $Z'=2\ y_1+10\ y_2+12\ y_3$
s.to the constraints $y_1+5y_2+3y_3 >= 5$,
$y_1+2\ y_2+8y_3 >= 3$, $y_1,y_2,y_3 >=0$

2. Min $z' = 2y_1 + 10y_2 + 12y_3$

subject To

$y_1 + 5y_2 + 3y_3 \geq 5$

$y_1 + 2y_2 + 8y_3 \geq 3$

$y_1, y_2, y_3 >= 0$

converting constraints into less than or equal to

$-y_1 - 5y_2 - 3y_3 \leq -5$

$-y_1 - 2y_2 - 8y_3 \leq -3$

$y_1, y_2, y_3 \geq 0$

Min $z = 2y_1 + 10y_2 + 12y_3 + 0s_1 + 0s_2$

Subject To

$-y_1 - 5y_2 - 3y_3 + s_1 = -5$

$-y_1 - 2y_2 - 8y_3 + s_2 = -3$

$y_1, y_2, y_3, s_1, s_2 \geq 0$

Intial Table

C_{B_i}	c_j	2	10	12	0	0	
	B.V	y_1	y_2	y_3	s_1	s_2	sol
0	s_1	-1	-5	-3	1	0	-5
0	s_2	-1	-2	-8	0	1	-3
	z_j	0	0	0	0	0	
	$c_j - z_j$	2	10	12	0	0	

Determination of Entering variable

Variables	y_1	y_2	y_3	s_1	s_2
$-(c_j - z_j)$	-2	-10	-12	0	0
s_1	-1	-5	-3	1	0
Ratio	2	2	4	–	–

Iteration - 2

C_{B_i}	c_j	2	10	12	0	0	
	B.V	y_1	y_2	y_3	s_1	s_2	Sol
2	y_1	1	5	3	-1	0	5
0	s_2	0	3	-5	-1	1	2
	z_j	2	10	6	-2	0	
	$c_j - z_j$	0	0	6	2	0	

Therefore, solution of dual problem

$y_1 = 5 \quad y_2 = 0 \quad y_3 = 0 \quad \text{Min } z' = 10$