

MP-1 TUTORIAL-4

1. Demonstrate the Duality in Linear Programming, Decomposition method

QUESTIONMinimize : $C = 16x_1 + 8x_2 + 4x_3$ Subject To: $3x_1 + 2x_2 + 2x_3 \geq 16$ $4x_1 + 3x_2 + x_3 \geq 14$ $5x_1 + 3x_2 + x_3 \geq 12$ $x_1, x_2, x_3 \geq 0$ MP-1

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1. Minimize : $C = 16x_1 + 8x_2 + 4x_3$
 subject to : $3x_1 + 2x_2 + 2x_3 \geq 16$
 $4x_1 + 3x_2 + x_3 \geq 14$
 $5x_1 + 3x_2 + x_3 \geq 12$
 $x_1, x_2, x_3 \geq 0$

Dual for above problem is

let y_1, y_2, y_3 be the variables in dual

Maximize $Z = 16y_1 + 14y_2 + 12y_3$

subject to : $3y_1 + 4y_2 + 5y_3 \leq 16$

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

$2y_1 + y_2 + y_3 \leq 4$

$y_1, y_2, y_3 \geq 0$

C_B	C_j	16	14	12	0	0	0	
	Basic variables	y_1	y_2	y_3	x_1	x_2	x_3	sol
0	x_1	3	4	5	1	0	0	16
0	x_2	2	3	3	0	1	0	8
0	x_3	2	1	1	0	0	1	4

$$z_j \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$$

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$$C_j - z_j \quad 16 \quad 14 \quad 12 \quad 0 \quad 0 \quad 0$$

Iteration - 1

C_{B_i}	C_j	16	14	12	0	0	0	
	Basic variables	y_1	y_2	y_3	x_1	x_2	x_3	Sol
0	x_1	0	$5/2$	$7/2$	1	0	$-3/2$	10
0	x_2	0	2	2	0	1	-1	4
16	y_1	1	$1/2$	$1/2$	0	0	$1/2$	2
Z_j		16	8	8	0	0	8	
$C_j - Z_j$		0	6	4	0	0	-8	

Iteration - 2

C_{B_i}	C_j	16	14	12	0	0	0	
	Basic variables	y_1	y_2	y_3	x_1	x_2	x_3	Sol
0	x_1	0	0	1	1	$-5/2$	$-1/4$	5
14	y_2	0	1	1	0	$1/2$	$-1/2$	2
16	y_1	1	0	0	0	$-1/4$	$3/4$	1
Z_j		16	14	12	0	3	5	
$C_j - Z_j$		0	0	0	0	-3	-5	

$$x_1 = 0$$

$$Z = 44$$

$$x_2 = 3$$

$$x_3 = 5$$



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