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15/ENG02/024

COMPUTER ENGINEERING

CLASSWORK

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Computer Engineering

Quiz

d_i = demand for the month i
z_i = number of workers during ith month; $z_0 = 30$
y_i = number of carpets made overtime in month i
x_i = number of carpets made during the ith month
h_i, f_i = workers hired and fired respectively at beginning of Month i
s_i = number of stored carpet stored at end of i;
s_0 = 0

$z_i, y_i, x_i, h_i, f_i, s_i, s_0, w_0 \geq 0 \quad i = 1, 2, 3 \ldots 12$

Total carpets made;

$$x_i = 20z_i + y_i$$

Potential number of workers at start of each month

$$z_i = z_{i-1} + h_i - f_i$$

Number of stored Carpets;

$$s_i = s_{i-1} + x_i - d_i$$

where $i-1$ = month before i

limitation of Overtime

$$y_i \leq 6z_i$$

Objective function is to minimize total cost; Hence;

$$\min = 2000\sum z_i + 320\sum h_i + 400\sum f_i + 8\sum s_i + 180\sum y_i$$

Coefficients are gotten from the question.

2) Production of Keyboard

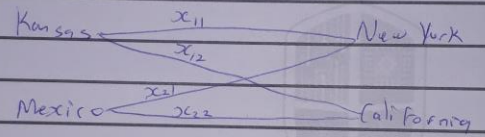
Kansas	15
Mexico	8

Consumption of Keyboard

New york	10
California	13

Transportation of keyboard

	New york ($)	California ($)
Mexico	4 (a_{21})	1 (a_{22})
Kansas	2 (a_{11})	3 (a_{12})



Production Constraint

$x_{11} + x_{12} \leq 15$

$x_{21} + x_{22} \leq 8$

Consumption Constraint

$x_{11} + x_{21} \leq 10$

$x_{12} + x_{22} \leq 13$

$\text{Min } z = a_{11} x_{11} + a_{12} x_{12} + a_{21} x_{21} + a_{22} x_{22}$

$\text{Min } z = 2x_{11} + 3x_{12} + 4x_{21} + x_{22}$

Substituting the transportation cost

Add slack;

~~S~~ = 2x1

Let; $x_{11} = x_1$

$x_{12} = x_2$

$x_{21} = x_3$

$x_{22} = x_4$

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

$x_1 + x_2 + s_1 = 15$

$x_3 + x_4 + s_2 = 8$

$x_1 + x_3 + s_3 = 10$

$x_2 + x_4 + s_4 = 13$

$Z - 2x_1 - 3x_2 - 4x_3 - x_4 = 0$

Iter	Basic Var	x_1	x_2	x_3	x_4	s_1	s_2	s_3	s_4	RHS	Ratio
0	Z	-2	-3	-4	-1	0	0	0	0	0	0
	s_1	1	1	0	0	1	0	0	0	15	$\frac{15}{0}=0$
	s_2	0	0	1	1	0	1	0	0	8	$\frac{8}{1}=8$
	s_3	1	0	1	0	0	0	1	0	10	$\frac{10}{1}=10$
	s_4	0	1	0	1	0	0	0	1	13	$\frac{13}{0}=0$

Most negative value from Z row is -4 hence we make x_3 Key Column. Therefore row s_2 is our key row

Iter	Basic Var	x_1	x_2	x_3	x_4	s_1	s_2	s_3	s_4	RHS	Ratio
1	Z	-2	-3	0	3	0	4	0	0	32	
	s_1	1	1	0	0	1	0	0	0	15	$\frac{15}{1}=15$
	x_3	0	0	1	1	0	1	0	0	8	$\frac{8}{0}=0$
	s_3	1	0	0	-1	0	-1	1	0	2	$\frac{2}{0}=0$
	s_4	0	1	0	1	0	0	0	1	13	$\frac{13}{1}=13$

lowest Z value is -3 making x_2 the Key Column, Hence we have row s_4 as key

Iter	Basic Values	x_1	x_2	x_3	x_4	S_1	S_2	S_3	S_4	RHS	Ratio
2	$Z+3x_2$	-2	0	0	6	0	4	0	3	71	
	S_1	1	0	0	-1	1	0	0	-1	2	$\frac{2}{1}=2$
	x_3	0	0	1	1	0	1	0	0	8	$\frac{8}{0}=8$
	S_3	1	0	0	-1	0	-1	1	0	2	$\frac{2}{1}=2$
	x_2	0	1	0	1	0	0	0	1	13	$\frac{13}{0}=0$

Since -2 is the lowest Z value we Pick x_1 as Key Colum

Here we select ~~x_2~~ Row S_1 as key row

Iter	Basic Values	x_1	x_2	x_3	x_4	S_1	S_2	S_3	S_4	RHS	Ratio
3	$Z+2x_2$	0	0	0	4	2	4	0	1	75	
	x_4	1	0	0	-1	1	0	0	-1	2	
	x_3	0	0	1	1	0	1	0	0	8	
	S_3	0	0	0	0	-1	-1	1	1	0	
	x_2	0	1	0	1	0	0	0	1	13	

Therefore; ~~$Z_{min}=67$~~ $x_1 = 2$

$x_2 = 13$

$x_3 = 8$

$x_4 = 0$

Hence Z_{min} (minimum cost) = 75.