16/ENG02/082 HASTHIM ABDUL-HAPI

(1) w_i = no of workers in month

w_0 = 50

x_i = no of carpets in month

Q_i = carpets made in month i

l_i, f_i = no of workers hired and fired at start

s_i = no of stored carpets at month

$s_0 = 0$

$w_i, x_i, l_i, f_i, s_i \geq 0$

$i = 1 \ldots 12$

Total carpet made in month with overtime machinery

$x_i = 20 w_i + Q_i$

workers may change by hiring / firing

~~$x_i = 20 w_i$~~

$w_i = w_{i-1} + l_i - f_i$

at the end of a month carpets stored =

amount made - amount supplied + storing amount

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

Overtime is definite $Q_i \leq l_i$

To minimize Cost, Z

$Z = 2000 \sum w_i + 320 \sum l_i + 400 \sum f_{i-1}$ & $\sum s_i$

$+ 180 \sum Q_i$

To obtain initial solution using northwest corner method

From / TO	NY	Cal	Supply
Kansas	10 [2]	5 [3]	15
Mexico	[4]	8 [1]	8
Demand	10	13	

Critical flexibility Solution

$x_{KN} = 10$

$x_{KC} = 5$

$x_{MC} = 8$

$Z = 4(0) + 1(8) + 2(10) + 3(5)$

$= 43$

Next is to solve the model for optimal solution (minimum total cost) using the modified destribution method (MODI)

Kansas 15 } Producer
Mexico 8 }

NY 10 } Consumer
California 13 }

	NY	Cal
Kansas	$ 2	$ 3
Mexico	$ 4	$ 1

Minimize $Z = 4x_{MN} + 1x_{MC} + 2x_{KN} + 3x_{KC}$

MN → Mexico New-York

MC → Mexico to California

KN → Kansas - New York

KC → Kansas - California

		$K_N = 2$		$V = 3$ Supply
$U_K = 0$	Kansas	10 [2]	5 [2]	15
$U_M = -2$	Mexico	[4]	8 [4]	8
	demand			

To evaluate unit values (empty cell)

$C_{ij} - U_M - V_M = K_N V$

x_{MN} : K_{NF} $= C_{MN} - U_M - V_N$

$= 4 + 2 - 2$

$= 4$

Since the value is non-negative the solution is optimal $\Rightarrow \$43$

Kansas to NY = 10

Kansas to California = 5

Mexico to New York = 0

Mexico to California = 8

	V_i	V_N	V_C	
U_i	from \ to	NY	Cal	Supply
U_K	Kansas	10 [2]	5 [2]	15
U_M	Mexico	[4]	8 [1]	8
	demand	10	13	

$U_i + V_j = C_{ij}$

$x_{KN} = U_K + V_N = 2$

$x_{KC} = U_K + V_C = 3$

$x_{MC} = U_M + V_C = 1$

4 unknown

$x_{KN} = u_K \cdot 1 \; v_N = 2$

let $u_K = 0$

$x_{LN} = v_N = 2$

$x_{KC} = u_K \cdot x_{LC} = 3$

$v_L = 3$

$x_{ML} : u_M \cdot v_C = 1$

$u_M = 1 - v_C = -2$