

## OJO OLAGLUWA

- ① - let the number of employees during each month,  $i$ , be  $e_i$  ;
- let the number of microprocessors made during each month,  $i$ , be  $x_i$  ;
  - let the number of ~~microprocessors~~ <sup>microprocessors</sup> made during overtime each month,  $i$ , be  $o_i$  ;
  - let the number of stored microprocessor at the end of each month,  $i$ , be  $sm_i$  ;
  - let the number of hired employees at the beginning of each month,  $i$ , be  $h_i$  ;
  - let the number of fired employees at the beginning of each month,  $i$ , be  $f_i$  ;

### constraints

- number of ~~comp~~ microprocessors made each month including overtime ~~is~~ <sup>including</sup> ~~overtime~~ <sub>overtime</sub>

$$x_i = 20e_i + o_i$$

- number of employees at the start of each month

$$e_i = e_{i-1} + h_i - f_i$$

i.e number of employees the previous month + number of hired employees - number of fired employees

- number of carpets at the end
- number of <sup>stored</sup> microprocessors at the end of each month is equal to;

the number of microprocessors at the start of the month + new processors made that month - number of processors sold.

$$= s_m; = s_{m;-1} + x_i - d_i$$

- overtime constraint

since workers can put in at most 30% overtime;

the number of overtime microprocessors each month is

$$30\% \text{ of } 20$$

$$= \frac{30}{100} \times 20$$

$$= 6$$

$$\therefore o_i \leq 6e_i$$

$\therefore$  objective function

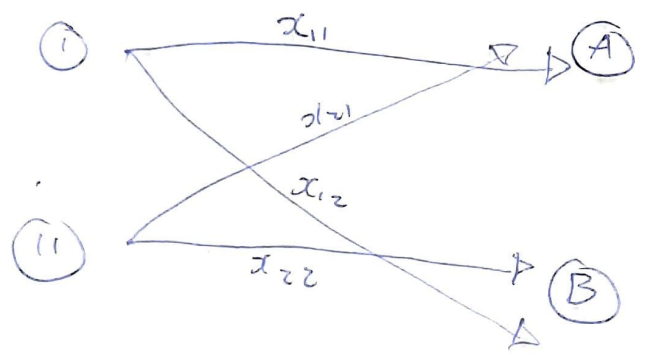
$$Z = 2000 \sum_i e_i + 320 \sum_i h_i + 400 \sum_i f_i + 8 \sum_i s_m; + 180 \sum_i o_i$$

2a)

Production	cartons
I Kansas	15
II Mexico	8

Consumer	bags
A New York	10
B California	13

	cost of shipping	
	New York (A)	California (B)
Kansas (I)	2	3
Mexico (II)	4	1



~~$x_{11} + x_{12}$~~   
 Production constraint  
 $x_{11} + x_{12} \leq 15$   
 $x_{21} + x_{22} \leq 8$

with consumption constraint

2b

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

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

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

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

with constraints

$$x_{11} + x_{21} \leq 10 ; \quad x_{11} + x_{12} \leq 15$$

$$x_{12} + x_{22} \leq 13 ; \quad x_{21} + x_{22} \leq 8$$

$$\begin{array}{ccccc}
 x_{11} & x_{21} & & & \\
 1 & 1 & 0 & 0 & 10 \\
 0 & 0 & 1 & 1 & 13
 \end{array}$$

$$\begin{array}{cccc|c}
 x_{11} & x_{12} & x_{21} & x_{22} & \\
 1 & 1 & 0 & 0 & 15 \\
 0 & 0 & 1 & 1 & 8 \\
 \hline
 1 & 0 & 1 & 0 & 10 \\
 0 & 1 & 0 & 1 & 13 \\
 \hline
 \frac{0}{2} & \frac{1}{3} & \frac{0}{4} & \frac{1}{1} & \frac{13}{0}
 \end{array}$$

transposing The matrix

$$\begin{array}{cccc|c}
 1 & 0 & 1 & 10 & 2 \\
 1 & 0 & 0 & 1 & 3 \\
 0 & 1 & 1 & 0 & 4 \\
 0 & 1 & 0 & 1 & 1 \\
 \hline
 15 & 8 & 10 & 13 & 0
 \end{array}$$

$$\begin{array}{cccc|cccc|c}
 \hat{1} & 0 & 1 & 0 & s_1 & s_2 & s_3 & s_4 & \\
 1 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 8 \\
 1 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 3 \\
 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 4 \\
 0 & 1 & 0 & 1 & 0 & 0 & 0 & 1 & 1 \\
 \hline
 -15 & -8 & -10 & -13 & 0 & 0 & 0 & 0 & 0
 \end{array}$$

$$R_2 = -R_1 + R_2$$

$$R_5 = 15R_1 + R_5$$

$$\begin{array}{cccc|cccc|c} 1 & 0 & 1 & 0 & -1 & 0 & 0 & 0 & 2 \end{array}$$

$$\begin{array}{cccc|cccc|c} 0 & 0 & -1 & 1 & -1 & 1 & 0 & 0 & 1 \end{array}$$

$$\begin{array}{cccc|cccc|c} 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 4 \end{array}$$

$$\begin{array}{cccc|cccc|c} 0 & 1 & 0 & 1 & 0 & 0 & 0 & 1 & 1 \end{array}$$

$$\begin{array}{cccc|cccc|c} 0 & -8 & 5 & -13 & 15 & 0 & 0 & 0 & 30 \end{array}$$

$$R_4 = -R_2 + R_4$$

$$R_5 = 13R_2 + 12R_3$$

$$\begin{array}{cccc|cccc} 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 2 \\ 0 & 0 & -1 & 1 & -1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 & 1 & 0 & 4 \\ \hline 0 & 1 & 1 & 0 & 1 & -1 & 0 & 1 & 0 \\ 0 & -8 & -8 & 0 & 2 & 13 & 0 & 0 & 43 \end{array}$$

$$R_4 = R_3 + R_4$$

$$R_5 = 8R_3 + R_5$$

$$\begin{array}{cccc|cccc} 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 2 \\ 0 & 0 & -1 & 1 & -1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 4 \\ 0 & 0 & 0 & 0 & 1 & -1 & -1 & 0 & -4 \\ \hline 0 & 0 & 0 & 0 & 2 & 13 & 8 & 1 & 75 \end{array}$$

$$\therefore x_{11} = 2$$

$$x_{12} = 13$$

$$x_{21} = 8$$

$$z = 75$$