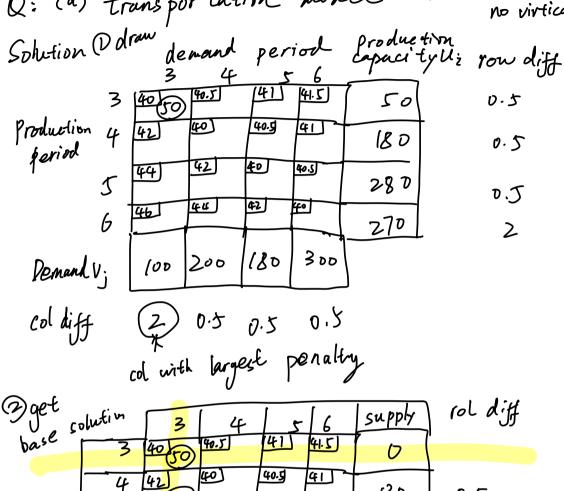
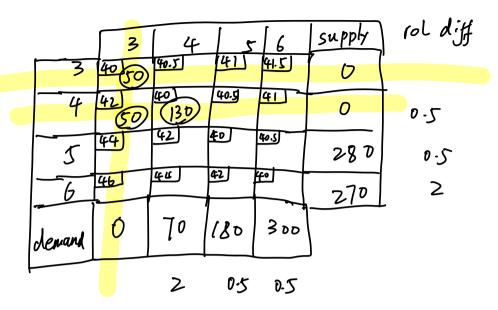
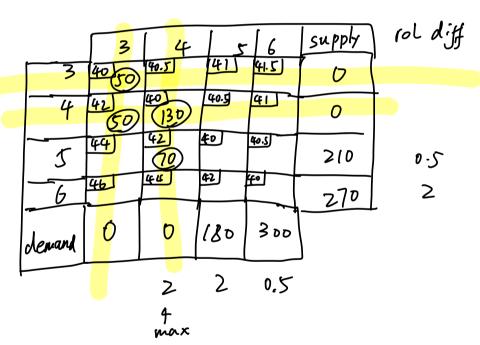
Q: (a) transportation model

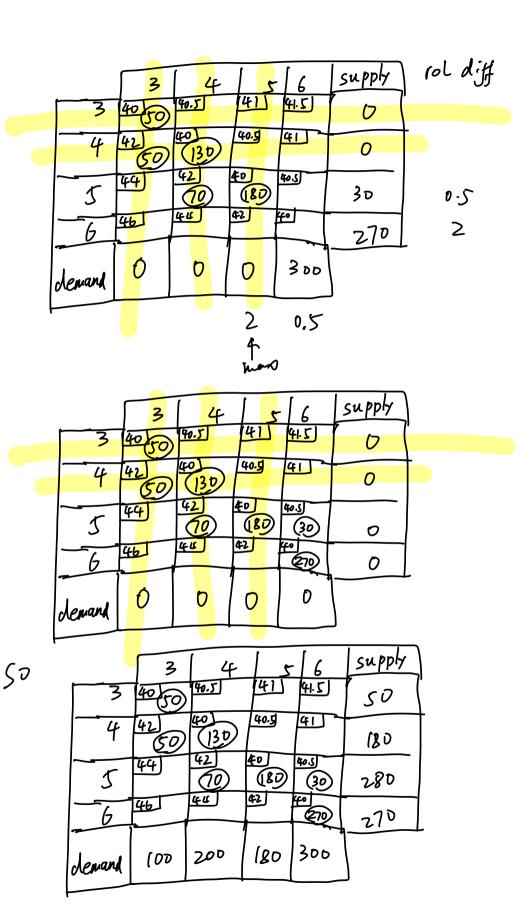
(on + 200 + 180 + 3 on = 780 no virtical supply



130 0.5 42 **40** 44 40.5 28 D 0.5 ५८ 42 40 46 2 270 300 180 200 demand 2 0.5 2 0.5 mark







3 fest optimal

. +	- april	3	1 4	1 0	- 6	supply	Wi
	3	4050	40.5	415	41.5) S	50	" -4
	4	42 50	(130)	40.g 2.5	2.5	(80	-2
	5	44) O	(10)	(80)	30	280	D
	6	46 2.5	7.7	2.5	#0 E70	270	-0-5
	demand	(O)	200	180	300		
-	Vi	44	42	40	40.5	-	

So, the solution is optimal

Cb) L?

Solution

$$0 = \pi_1^2 + x_2^2 + x_3^2 + \lambda_1(x_1 + x_2 + 3x_3 - 2) + \lambda_2(5x_1 + 2x_2 + x_3 - 5)$$

$$\frac{\partial L}{\partial x_1} = 2X_1 + \lambda_1 + J\lambda_2 = 0 \tag{1}$$

$$\frac{\partial L}{\partial x_2} = 2X_2 + \lambda_1 + 2\lambda_2 = 0 \qquad (2)$$

$$\frac{\partial L}{\partial x_3} = 2x_3 + 3\lambda_1 + \lambda_2 = 0 \qquad (3)$$

$$\frac{\partial L}{\partial \lambda_1} = \chi_1 + \chi_2 + 3\chi_3 - 2 = 0 \tag{4}$$

$$\frac{\partial L}{\partial \lambda_2} = \int X_1 + 2X_2 + X_3 - J = 0$$
 (5)

Solve the equation using casio only 47\$\frac{1}{2}\$ from (3)
$$\lambda_2 = -(2X_2 + 3\lambda_1)$$
 ft $\lambda(1)$ (2) $2X_1 + \lambda_1 - 5(2X_2 + 3\lambda_1) = 2X_1 - 10X_3 - 14\lambda_1 = 0$ $2X_2 + \lambda_1 - 2(2X_2 + 3\lambda_1) = 2X_2 + \lambda_1 - 4X_2 - 6\lambda_1$ $= 2X_2 - 4X_3 - 5\lambda_1 = 0$ Casio solve
$$\begin{bmatrix} 2 & 0 - 10 & -14 \\ 2 & 0 - 4 & -5 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \begin{cases} X_1 = -\frac{1}{12} \\ X_2 = \frac{17}{6} \end{cases}$$

$$\begin{bmatrix}
2 & 0 - 10 & -14 \\
2 & 0 - 4 & -5
\end{bmatrix}$$

$$\begin{bmatrix}
1 & 1 & 3 & 0 \\
5 & 2 & 1 & 0
\end{bmatrix}$$

$$\lambda_{2} = -\frac{1}{4}$$

$$\lambda_{1} = \frac{1}{6}$$

$$\lambda_{1} = \frac{1}{6}$$

$$\lambda_{2} = -\left[2x(-\frac{1}{4}) + 3x(-\frac{1}{6})\right]$$

$$X = \left[-\frac{1}{12} \frac{17}{6} - \frac{1}{4} \right]$$

$$Z = X_1^2 + X_2^2 + X_3^2 = \frac{583}{72}$$

$$= 8.0972$$

= 0

9 test optimal
$$Dh_{i}(x) = [1 \] \ 3]$$
 $Dh_{i}(x)Y = y_{i} + y_{2} + 3y_{3} = 0$

$$\frac{\partial^{2}L}{\partial x_{1}}(x,\lambda) = \begin{bmatrix} \frac{\partial L}{\partial x_{1}\partial x_{1}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} & \frac{\partial L}{\partial x_{1}\partial x_{2}} \\ \frac{\partial L}{\partial x_{2}\partial x_{1}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 2 & 0 \end{bmatrix}$$

$$\frac{\partial L}{\partial x_{3}\partial x_{1}} = \frac{\partial L}{\partial x_{2}\partial x_{1}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \\ 0 & 0 & 2 \end{bmatrix}$$

$$\frac{\partial L}{\partial x_{1}} = 2X_{1} + \lambda_{1} + J\lambda_{2} = 0 \qquad \frac{\partial L}{\partial x_{2}\partial x_{2}} = 2$$
positive - Lefinite

$$\frac{\partial L}{\partial x_{1}} = 2X_{1} + \lambda_{1} + J\lambda_{2} = 0 \qquad \frac{\partial L}{\partial x_{1}\partial x_{1}} = 2$$

$$\frac{\partial L}{\partial x_{2}} = 2X_{2} + \lambda_{1} + J\lambda_{2} = 0 \qquad \frac{\partial L}{\partial x_{2}\partial x_{2}} = 2$$

$$\frac{\partial L}{\partial x_{2}} = 2X_{3} + 3\lambda_{1} + \lambda_{2} = 0 \qquad \frac{\partial L}{\partial x_{2}\partial x_{2}} = 2$$

$$Y^{T} \nabla_{X}^{2} = [y, y_{2} y_{3}] \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix} \begin{bmatrix} y_{1} \\ y_{2} \\ y_{3} \end{bmatrix}$$

$$= [2y_{1} \ 2y_{2} \ 2y_{3}] \begin{bmatrix} y_{1} \\ y_{2} \\ y_{2} \end{bmatrix}$$

$$= 2y_{1}^{2} + 2y_{2}^{2} + 2y_{3}^{2} > 0 \quad \forall \quad y \neq 0$$

$$So \quad X = [-\frac{1}{12} \ \frac{17}{6} \ -\frac{1}{4}] \quad j \leq \quad a \quad minimum \quad point$$

$$Z = \chi_1^2 + \chi_2^2 + \chi_3^2 = \frac{583}{72}$$
$$= 8.0972$$