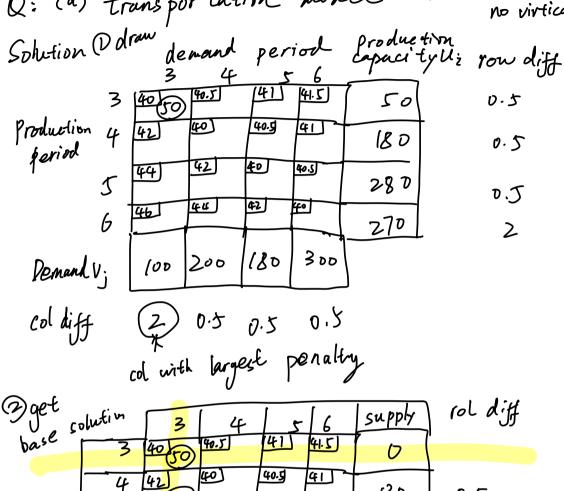
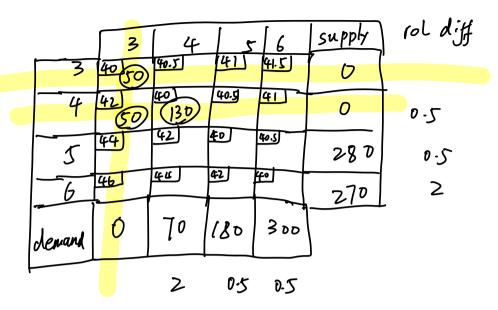
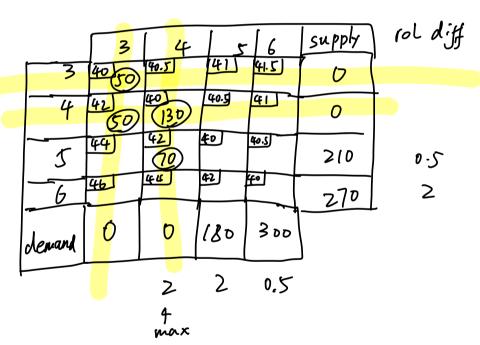
Q: (a) transportation model

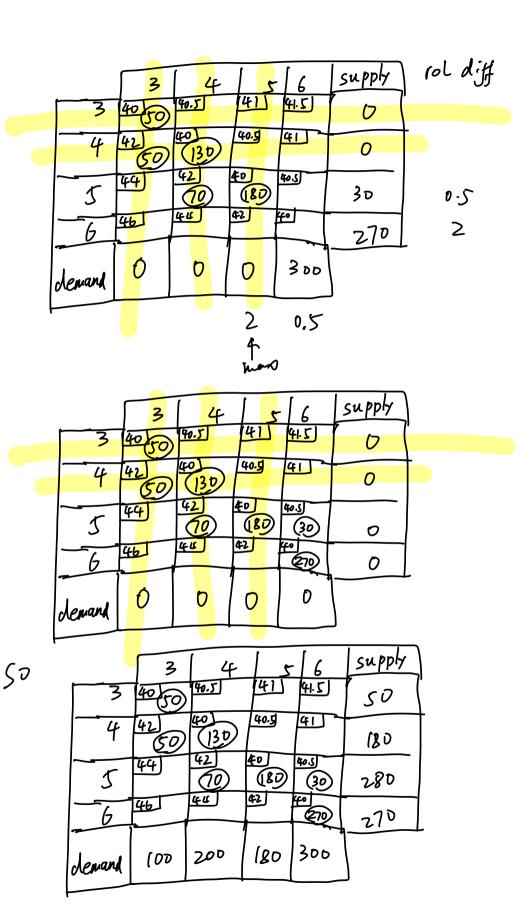
(on + 200 + 180 + 3 on = 780 no virtical supply



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
$$\frac{casid}{casid}$$
 only $\frac{4}{14}$ $\frac{1}{2}$ $\frac{1}{$

$$X = \begin{bmatrix} \frac{37}{46} & \frac{8}{23} & \frac{13}{46} \end{bmatrix}$$

$$Z = X_1^2 + X_2^2 + X_3^2 = \left(\frac{37}{46}\right)^2 + \left(\frac{8}{23}\right)^2 + \left(\frac{13}{46}\right)^2$$

$$= \frac{39}{46} = 0.8478$$

This optimal

$$\nabla h_{1}(x) = \begin{bmatrix} 1 & 3 \end{bmatrix} \qquad \nabla h_{2}(x) = \begin{bmatrix} 5 & 2 & 1 \end{bmatrix} \\
\nabla h_{1}(x) Y = y_{1} + y_{2} + 3y_{3} = 0 \qquad \nabla h_{2}(x) Y = 5y_{1} + 2y_{2} + y_{3} = 0$$

$$\nabla h_{2}(x) Y = 5y_{1} + 2y_{2} + y_{3} = 0$$

$$\nabla h_{2}(x) Y = 5y_{1} + 2y_{2} + y_{3} = 0$$

$$\nabla h_{2}(x) Y = 5y_{1} + 2y_{2} + y_{3} = 0$$

$$\frac{\partial^{2}L}{\partial x_{1}}(x,\lambda) = \begin{bmatrix} \frac{\partial L}{\partial x_{1}\partial x_{1}} & \frac{\partial L}{\partial x_{1}\partial x_{2}} & \frac{\partial L}{\partial x_{1}\partial x_{2}} \\ \frac{\partial L}{\partial x_{2}\partial x_{1}} & \frac{\partial L}{\partial x_{2}\partial x_{2}} & \frac{\partial L}{\partial x_{2}\partial x_{3}} \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 2 & 0 \end{bmatrix}$$

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

$$\frac{\partial L}{\partial x_{1}\partial x_{1}} = 2X_{1} + \lambda_{1} + 5\lambda_{2} = 0 \quad \frac{\partial L}{\partial x_{1}\partial x_{1}} = 2$$

$$\frac{\partial L}{\partial x_{1}\partial x_{1}} = 2X_{1} + \lambda_{1} + 5\lambda_{2} = 0 \quad \frac{\partial L}{\partial x_{1}\partial x_{1}} = 2$$

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

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

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

$$\frac{\partial L}{\partial x_3} = 2x_3 + 3\lambda_1 + \lambda_2 = 0 \quad \frac{\partial L}{\partial x_3 \lambda x_3} = 2$$

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

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

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

So
$$X = \begin{bmatrix} \frac{37}{46} & \frac{8}{23} & \frac{13}{46} \end{bmatrix}$$
 is a minimum point $Z = X_1^2 + X_2^2 + X_3^2 = \frac{39}{46} = 0.8478$ is the minimum value

$$Z=X_1^2+X_2^2+X_3^2=\frac{39}{46}=0.8478$$
 is the minimum value