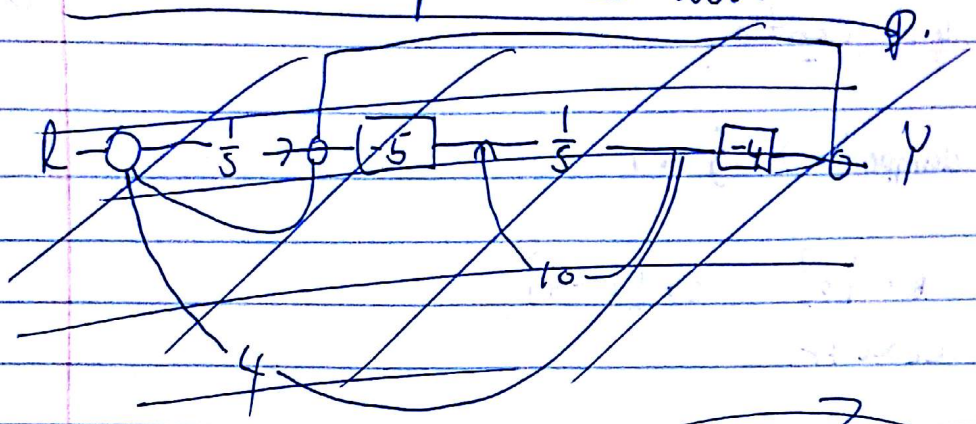
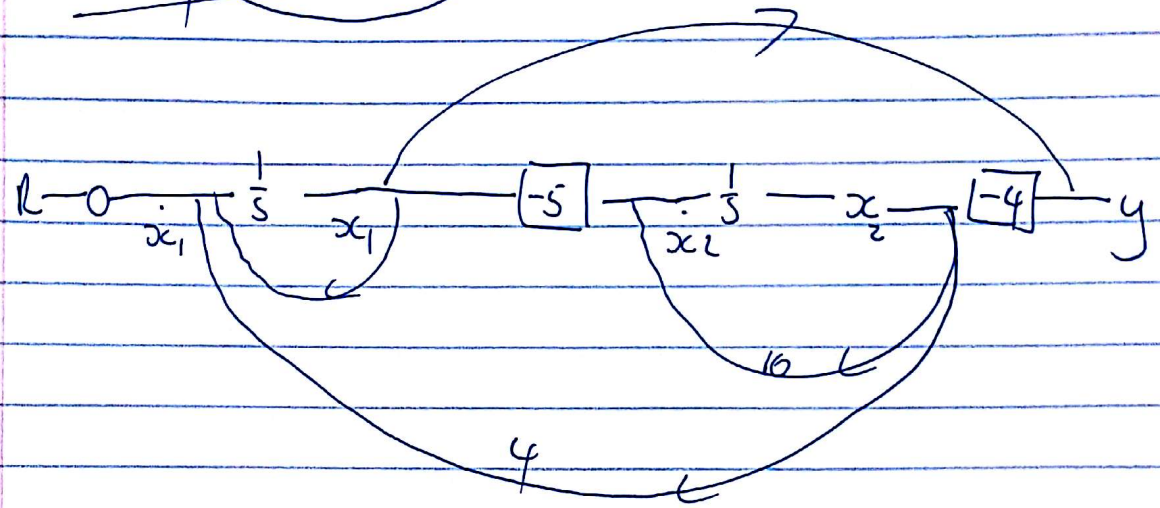
pkjun16 418 question 1 doodle





$\dot{x}_1 = x_1 + 4x_2 + r$

$\dot{x}_2 = -5x_1 + 10x_2$

$y = x_1 - 4x_2$

$\dot{x} = A\underline{x} + Bu$

$y = C\underline{x}$

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}1 & 4\\ -5 & 10\end{bmatrix}\underline{x} + \begin{bmatrix}1\\ 0\end{bmatrix}u$$

$$y = \begin{bmatrix}1 & -4\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}.$$

$$P_c = \begin{bmatrix}1 & 1\\ 0 & -5\end{bmatrix}$$

$|P_c| = -5 \neq 0 \therefore$ controllable

$$P_o = \begin{bmatrix}1 & -4\\ 21 & -36\end{bmatrix}$$

$|P_o| \neq 0 \therefore$ observable.