(1) A model has $A = \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $C = [-1 \quad 1]$, Find the poles of the system, also find the gain such that the closed loop poles are at -1 and -2. Draw the simulation diagram with feedback.

(2) Determine the state transition matrix of the model which has a matrix

$$A = \begin{bmatrix} -4 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -2 \end{bmatrix}$$

(3) $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u, \quad y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + 3u$, Find the total response of the given model when $X_{1(0)} = 1$, $X_{2(0)} = -1$, & u=5

(4) $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} -1 \\ 1 \end{bmatrix} u, \quad y = [1 \quad 0] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + 0u$, (a) find the system is stable or not? (b) Find the model is controlable or not? (c) if the model is uncontrollable explain why the model is uncontrollable and show me the calculations.

Find the solution if the desired poles are at -2 and -3

Find the solution if the desired poles are at -1 and -3 also write your obervation for the above example