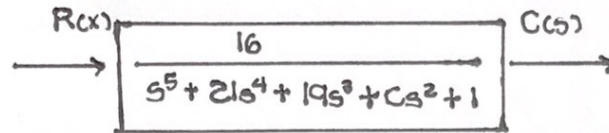


2.)



$$\frac{C(s)}{R(s)} = \frac{16}{s^5 + 21s^4 + 19s^3 + 6s^2 + 1}$$

$$C(s) [s^5 + 21s^4 + 19s^3 + 6s^2 + 1] = 16R(s)$$

$$\mathcal{L}^{-1} \{ s^5 C(s) + 21s^4 C(s) + 19s^3 C(s) + 6s^2 C(s) + C(s) \} = 16R(s)$$

$$\ddot{\ddot{\ddot{C}}} + 21\ddot{\ddot{C}} + 19\ddot{C} + 6\dot{C} + C = 16r$$

$\begin{matrix} x_5 & x_5 & x_4 & x_3 & x_1 & u_1 \end{matrix}$

$$x_1 = C \quad \dot{x}_1 = \dot{C} = x_2 \quad u_1 = r$$

$$x_2 = \dot{C} \quad \dot{x}_2 = \ddot{C} = x_3$$

$$x_3 = \ddot{C} \quad \dot{x}_3 = \ddot{\ddot{C}} = x_4$$

$$x_4 = \ddot{\ddot{C}} \quad \dot{x}_4 = \ddot{\ddot{\ddot{C}}} = x_5$$

$$x_5 = \ddot{\ddot{\ddot{C}}} \quad \dot{x}_5 = \ddot{\ddot{\ddot{\ddot{C}}}}$$

$$\dot{x}_1 = 0x_1 + x_2 + 0x_3 + 0x_4 + 0x_5 + 0u_1$$

$$\dot{x}_2 = 0x_1 + 0x_2 + x_3 + 0x_4 + 0x_5 + 0u_1$$

$$\dot{x}_3 = 0x_1 + 0x_2 + 0x_3 + x_4 + 0x_5 + 0u_1$$

$$\dot{x}_4 = 0x_1 + 0x_2 + 0x_3 + 0x_4 + x_5 + 0u_1$$

$$\dot{x}_5 = -x_1 + 0x_2 - 6x_3 - 19x_4 - 21x_5 + 16u_1$$

STATE SPACE EQUATION									
	x_1	x_2	x_3	x_4	x_5		x_1	x_2	x_3
\dot{x}_1	0	1	0	0	0	+ $\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 16 \end{bmatrix} u_1$	x_1		
\dot{x}_2	0	0	1	0	0		x_2		
\dot{x}_3	0	0	0	1	0		x_3		
\dot{x}_4	0	0	0	0	1		x_4		
\dot{x}_5	-1	0	-6	-19	-21		x_5		

$$y = C = x_1$$

$$y = [1 \ 0 \ 0 \ 0 \ 0] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} + [0] u_1$$