10a \[ H(s) = \frac{4s^3+8}{s^4+5s^2+6} \] 
\[ d + \frac{b_3+b_0}{s^3+a_1+a_0} \]
\[ \left[ \begin{array}{l} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[ \begin{array}{l} a_0-a_1 \\ \vdots \\ 1 \end{array} \right] \]
\[ y = \left[ \begin{array}{l} b_0 \\ b_1 \end{array} \right] \]
\[ \text{pola: } s = -\frac{1}{2} \pm \sqrt{\frac{5}{2}} \]

10b \[ \left[ \begin{array}{ll} 1 & 1 \\ -1 & 0 \end{array} \right] \left[ \begin{array}{l} x_1 \\ x_2 \end{array} \right] + \left[ \begin{array}{l} 2 \\ 1 \end{array} \right] \left[ \begin{array}{l} r \\ d \end{array} \right] \]
\[ y = \left[ \begin{array}{l} 1 \\ 0 \end{array} \right] \left[ \begin{array}{l} x_1 \\ x_2 \end{array} \right] \]

5a \[ H(s) = \frac{1}{s(s^2-6s+8)} \]

10b \[ \vec{F} = s(s-2)(s-4) \quad \lambda_1 = 0, \lambda_2 = 2, \lambda_3 = 4 
\]
\[ x_1 = \left[ \begin{array}{l} 0 \\ 0 \end{array} \right], \quad x_2 = \left[ \begin{array}{l} 1 \\ 4 \end{array} \right], \quad x_3 = \left[ \begin{array}{l} 2 \\ 4 \end{array} \right] 
\]
\[ X = \left[ \begin{array}{ccc} t & t & t \\ \frac{t^2}{2} & \frac{t^2}{2} & \frac{t^2}{2} \end{array} \right] \]
\[ e^{At} = X \quad e^{At} Y = \sum_{i=1}^{3} e^{\lambda_i t} x_i y_i \]

5c \[ H(x) = X_1, \quad \text{then } x(4) = e^{At} x_1, \quad i = 1, 2, 3. \]

3 \[ X = \left[ \begin{array}{c} \frac{1}{2s+4} \\ \frac{1}{2s+4} \\ \frac{1}{s+2} \end{array} \right] \]
\[ X_1 = \left[ \begin{array}{c} \frac{A}{s+2} \\ \frac{B}{s+4} \\ \frac{C}{s+2} \end{array} \right] \]-> \quad x_1 = At + B + Ce^{-2t} \quad t > 0 \]

4 \[ A = \left[ \begin{array}{c} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right] \quad B = \left[ \begin{array}{c} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right] \quad \text{at } s = 0, 0 \]
\[ E = \left[ \begin{array}{c} \frac{1}{2} \\ \frac{1}{2} \end{array} \right] \quad \text{at } s = -2, -2 \]

4a \[ H(s) = C(s-I-A)^{-1}B+D = \left[ \begin{array}{c} \frac{1}{2} \\ \frac{1}{2} \end{array} \right] + \left[ \begin{array}{c} 1 \\ 0 \end{array} \right] = \left[ \begin{array}{c} \frac{s-1}{2} \\ \frac{s+1}{2} \end{array} \right] \quad p(a) = \{s=0, 0\} \]

6a \[ A^2 + H = 3-1-1 = 0 \]

6b \[ P(s) = \left[ \begin{array}{c} \frac{1}{4} \\ \frac{1}{4} \\ \frac{1}{4} \end{array} \right] \quad u_0 = \left[ \begin{array}{c} 0 \\ 0 \end{array} \right] \]

5 \[ \left[ \begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[ \begin{array}{l} \frac{1}{2} \\ 0 \end{array} \right] \left[ \begin{array}{c} x_1 \\ x_2 \end{array} \right] + \left[ \begin{array}{c} 0 \\ 1 \end{array} \right] u \quad y = \left[ \begin{array}{c} 0 \\ 1 \end{array} \right] e^{At} \]

A-BG = \left[ \begin{array}{cc} 2 & 1 \\ -1 & -1 \end{array} \right]
\[ \text{det}(sI-A+BG) = 5s^2 + (9-2)s + 9 \]
\[ = 5s^2 + 2s + 2 \]

8 \[ \frac{q^2}{2} = 4, \quad q = 6 \]

K_MBC = \left[ A-BG \right] \left[ H_1 G \right]
\[ K = \frac{K_MBC}{s} \]