ECE-320, Practice Quiz #8

1) Consider the characteristic equation $\Delta(s) = s^3 + 2ks^2 + s + 1$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 0$ b) no value of k c) $0 < k < 0.5$ d) $k > 0.5$

2) Consider the characteristic equation $\Delta(s) = s^3 + s^2 + s + 2k$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 0$ b) no value of k c) $0 < k < 0.5$ d) $k > 0.5$

3) Consider the characteristic equation $\Delta(s) = ks^3 + s^2 + s + 1$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 1$ b) no value of k c) $0 < k < 0.5$ d) $0 < k < 1$ e) $k > 0.5$

4) Consider the characteristic equation $\Delta(s) = s^4 + 3s^3 + 2s^2 + s + k$. Using the Routh-Hurwitz array, we can determine the system is stable for

a) all $k > 1$ b) no value of k c) $0 < k < 5/9$ d) $k > 5/9$ e) *all* $k > 0$

5) For the 2x2 matrix $P = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, the inverse of this matrix, P^{-1}, is which of the following:

a) $P^{-1} = \dfrac{1}{ad-bc}\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ b) $P^{-1} = \dfrac{1}{ad-bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ c) $P^{-1} = \dfrac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

d) $P^{-1} = \dfrac{1}{ad+bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ e) $P^{-1} = \dfrac{1}{ad+bc}\begin{bmatrix} d & b \\ c & a \end{bmatrix}$ f) none of these

6) For the following state variable model

$$\dot{q}(t) = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix} q(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$
$$y(t) = [1 \quad 2] q(t)$$

The poles of the system are at

a) -1 and -3 b) -2 and -2 c) 1 and 3 d) 0 and 1 e) 1 and 2

7) For the following state variable model

$$\dot{q}(t) = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} q(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$
$$y(t) = [1 \quad 2] q(t)$$

The poles of the system are at

a) -1 and -2   b) -1 and -1   c) 1 and 3   d) 0 and 1   e) 1 and 2

8) For the following state variable model

$$\dot{q}(t) = \begin{bmatrix} -1 & -1 \\ 1 & -3 \end{bmatrix} q(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$
$$y(t) = [1 \quad 2] q(t)$$

The poles of the system are at

a) -1 and -3   b) -2 and -2   c) 1 and 3   d) 0 and 1   e) -1 and -2

Answers: 1-d, 2-c, 3-d, 4-c, 5-c,
6-e, 7-b, 8-b