ECE-205 Practice Quiz 8

(no Tables, Calculators, or Computers)

Problems 1 and 2 refer to the following transfer function $H(s) = \frac{2s+1}{(s+1)^2+4}$

1) For this transfer function, the corresponding impulse response $h(t)$ is composed of which terms?

a) $e^{-t}\cos(2t), e^{-t}\sin(2t)$ b) $e^{-2t}\cos(t), e^{-2t}\sin(t)$

c) $e^{-t}\cos(4t), e^{-t}\sin(4t)$ d) $e^{-4t}\cos(t), e^{-4t}\sin(t)$

2) The **poles** of the transfer function are

a) $2 \pm j$ b) $-2 \pm j$

c) $-1 \pm 2j$ d) $-1 \pm 4j$

Problems 3 and 4 refer to the impulse responses of six different systems given below:

$$h_1(t) = [1+e^{-t}]u(t)$$
$$h_2(t) = e^{-2t}u(t)$$
$$h_3(t) = [2+\sin(t)]u(t)$$
$$h_4(t) = [1-t^3e^{-0.1t}]u(t)$$
$$h_5(t) = [1+t+e^{-t}]u(t)$$
$$h_6(t) = [te^{-t}\cos(5t)+e^{-2t}\sin(3t)]u(t)$$

3) The number of (asymptotically) **maginally stable systems** is a) 0 b) 1 c) 2 d) 3

4) The number of (asymptotically) **unstable systems** is a) 0 b) 1 c) 2 d) 3

5) Which of the following transfer functions represents a (asymptotically) **stable** system?

$$G_a(s)=\frac{s-1}{s+1} \qquad G_b(s)=\frac{1}{s(s+1)} \qquad G_c(s)=\frac{s}{s^2-1}$$

$$G_d(s)=\frac{s+1}{(s+1+j)(s+1-j)} \qquad G_e(s)=\frac{(s-1-j)(s-1+j)}{s} \qquad G_f(s)=\frac{(s-1-j)(s-1+j)}{(s+1-j)(s+1+j)}$$

a) all but G_c b) only G_a, G_b, and G_d c) only G_a, G_d, and G_f

d) only G_d and G_f e) only G_a and G_d

Problems 6 and 7 refer to the following impulse responses of six different systems

$$h_1(t)=[te^{-t}]u(t)$$
$$h_2(t)=e^{-2t}u(t)$$
$$h_3(t)=[2e^{-2t}+t^3\sin(t)]u(t)$$
$$h_4(t)=[1-t^3e^{-0.1t}]u(t)$$
$$h_5(t)=[1+t+e^{-t}]u(t)$$
$$h_6(t)=[te^{-t}\cos(5t)+e^{-2t}\sin(3t)]u(t)$$

6) The number of (asymptitcally) **unstable** systems is a) 1 b) 2 c) 3 d) 4

7) The number of (asymptotically) **marginally stable** systems is a) 1 b) 2 c) 3 d) 4

Problems 8 and 9 refer to a system with poles at -2+5j. -2-5j. -10+j, -10-j, and -20

8) The best estimate of the **settling time** for this system is

a) 2 seconds b) 0.4 seconds c) 4/5 seconds d) 0.2 seconds

9) The **dominant pole(s)** of this system are

a) -2+5j and -2-5j b) -10+j and -10-j c) -20

10) Which of the following transfer functions represents a (asymptotically) **stable** system?

$$G_a(s) = \frac{s-1}{s+1} \qquad G_b(s) = \frac{s}{(s+1)} \qquad G_c(s) = \frac{s}{s^2-1}$$

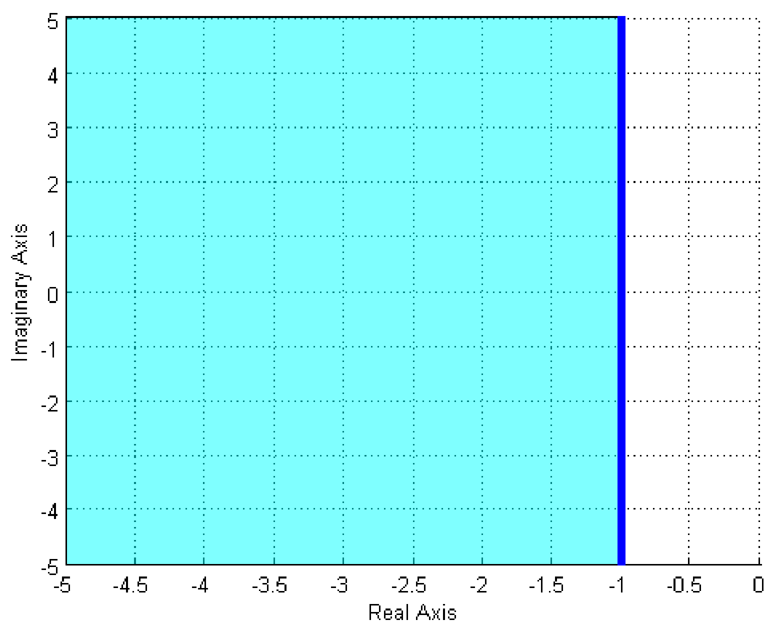
$$G_d(s) = \frac{s+1}{(s+1+j)(s+1-j)} \qquad G_e(s) = \frac{(s-1-j)(s-1+j)}{(s+2)^2} \qquad G_f(s) = \frac{(s-1-j)(s-1+j)}{(s+1-j)(s+1+j)}$$

a) all but G_c b) only G_a, G_b, and G_d c) only G_a, G_d, and G_f d) only G_d and G_f

e) only G_a and G_d

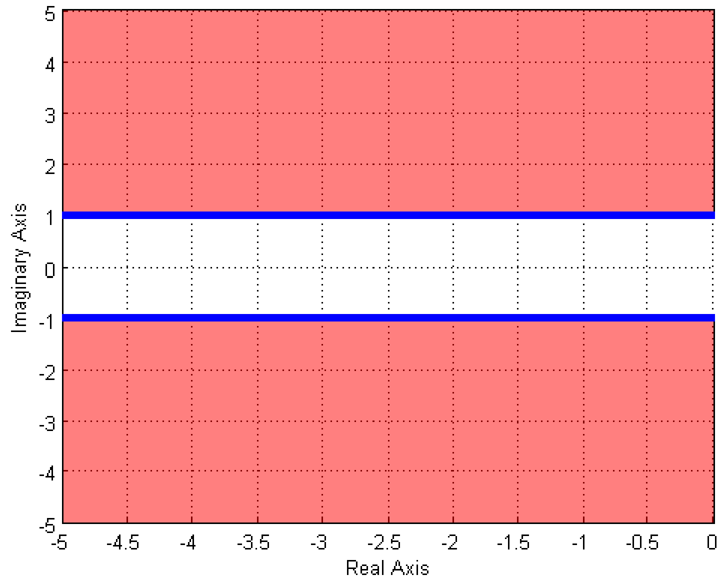
11) The (dark) shaded area in the s-plane figure below shows the possible pole location for an ideal second order system that meets which of the following constraints?

a) $T_s \le 1$ b) $T_s \ge 1$ c) $T_s \ge 4$ d) $T_s \le 4$ e) none of these

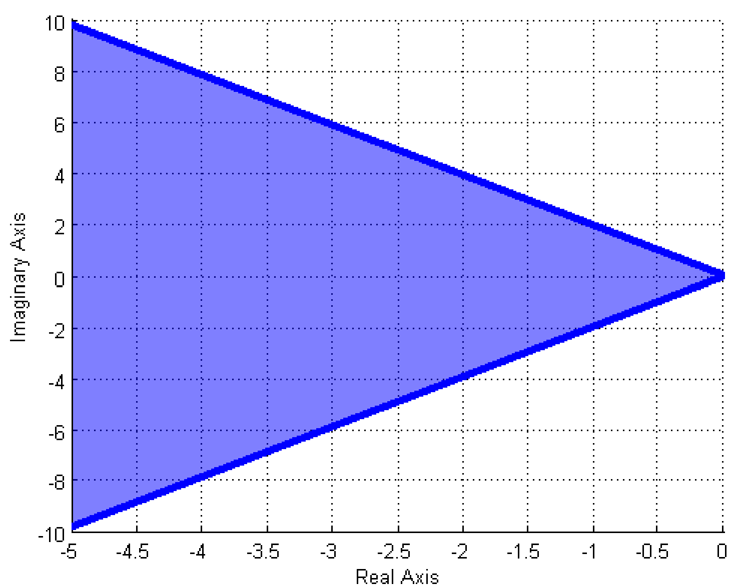


12) The (dark) shaded area in the s-plane figure below shows the possible pole location for an ideal second order system that meets which of the following constraints?

a) $T_p \leq 1$ b) $T_p \geq 1$ c) $T_p \geq \pi$ d) $T_p \leq \pi$ e) none of these



13) The (dark) shaded area in the s-plane figure below shows the possible pole location for an ideal second order system that meets which of the following constraints? a) $PO \geq 20\%$ b) $PO \leq 20\%$



Answers: 1-a, 2-c, 3-d, 4-b, 5-c, 6-b, 7-a, 8-a, 9-a, 10-a, 11-d, 12-d, 13-b