

## 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:

$$h_1(t) = [1 + e^{-t}]u(t)$$

$$h_2(t) = e^{-2t}u(t)$$

$$h_3(t) = [2 + \sin(t)]u(t)$$

$$h_4(t) = [1 - t^3 e^{-0.1t}]u(t)$$

$$h_5(t) = [1 + t + e^{-t}]u(t)$$

$$h_6(t) = [te^{-t} \cos(5t) + e^{-2t} \sin(3t)]u(t)$$

3) The number of (asymptotically) **magnally 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?

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

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

- 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

$$h_1(t) = [te^{-t}]u(t)$$

$$h_2(t) = e^{-2t}u(t)$$

$$h_3(t) = [2e^{-2t} + t^3 \sin(t)]u(t)$$

$$h_4(t) = [1 - t^3 e^{-0.1t}]u(t)$$

$$h_5(t) = [1 + t + e^{-t}]u(t)$$

$$h_6(t) = [te^{-t} \cos(5t) + e^{-2t} \sin(3t)]u(t)$$

- 6) The number of (asymptotically) **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?

$$G_a(s) = \frac{s-1}{s+1}$$

$$G_b(s) = \frac{s}{(s+1)}$$

$$G_c(s) = \frac{s}{s^2-1}$$

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

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

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

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  $G_d$

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