

**ECE-205 Quiz #8**

Problems 1 and 2 refer to a system with poles at  $-2+j$ ,  $-2-j$ ,  $-4$ ,  $-1+2j$ ,  $-1-2j$ , and  $-20$

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

- a) 4 seconds    b) 2 seconds    c) 1 second    d) 0.2 seconds

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

- a)  $-2+j$  and  $-2-j$     b)  $-1+2j$  and  $-1-2j$     c)  $-4$     d)  $-20$

3) How many terms will there be in the partial fraction expansion of  $H(s) = \frac{(s+1)^2}{s^2(s+2)^2}$ ?

- a) 2    b) 3    c) 4    d) 6

4) How many terms will there be in the partial fraction expansion of  $H(s) = \frac{s}{(s^2+1)(s+2)}$ ?

- a) 0    b) 1    c) 2    d) 3

5) An impulse response  $h(t)$  is composed of the terms  $1, e^{-t}, te^{-t}$

A possible corresponding transfer function (for some constant value  $A$ ) is

- a)  $H(s) = \frac{A}{s(s+1)}$                       b)  $H(s) = \frac{A}{s^2(s+1)}$   
 c)  $H(s) = \frac{As}{(s+1)}$                       d)  $H(s) = \frac{A}{s(s+1)^2}$

Problems 6 and 7 refer to the following transfer function

$$H(s) = \frac{2s+1}{(s+2)^2+1}$$

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

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

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

Problems 8 and 9 refer to the impulse responses of six different systems given below:

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

- 8) The number of **stable systems** is a) 0 b) 1 c) 2 d) 3
- 9) The number of **unstable systems** is a) 0 b) 1 c) 2 d) 3
- 10) Which of the following transfer functions represents a **stable** system?

$$\begin{aligned}
 G_a(s) &= \frac{s-1}{s+1} & G_b(s) &= \frac{1}{s(s+1)} & G_c(s) &= \frac{s}{s^2-1} \\
 G_d(s) &= \frac{s+1}{(s+1+j)(s+1-j)} & G_e(s) &= \frac{(s-1-j)(s-1+j)}{s} & G_f(s) &= \frac{(s-1-j)(s-1+j)}{(s+1-j)(s+1+j)}
 \end{aligned}$$

- 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) For the transfer function

$$H(s) = \frac{1}{s^2(s+2)}$$

the corresponding impulse response  $h(t)$  is composed of which terms?

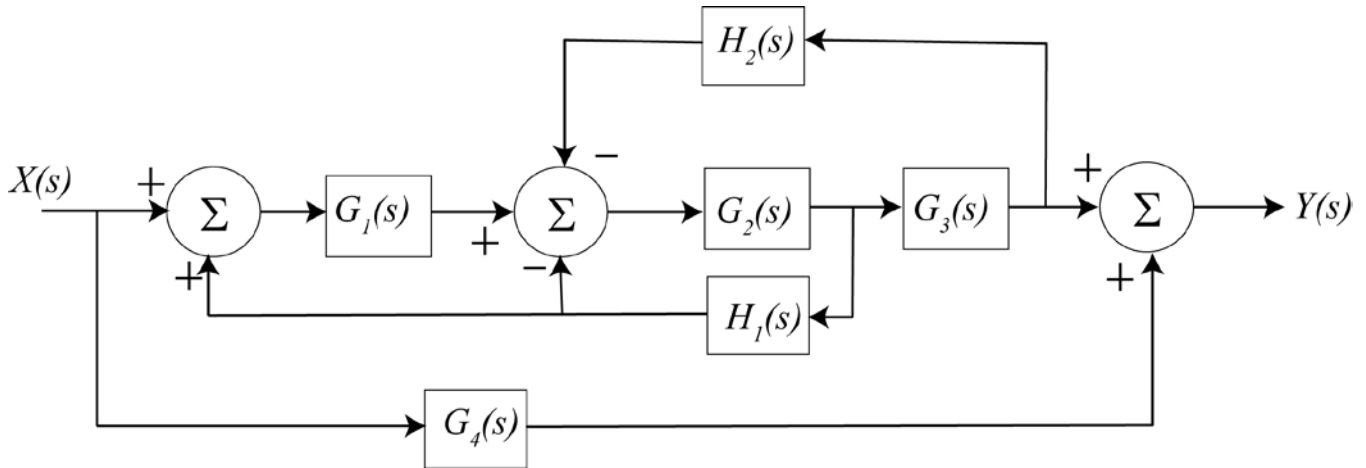
- a)  $t^2 e^{-2t}$  b)  $t$  and  $te^{-2t}$  c)  $1, t, te^{-2t}$
- d)  $t^2, e^{-2t}$  e) none of these

12) The Laplace transform of  $x(t) = u(t) - u(t-2)$  is

- a)  $X(s) = 1 - e^{-2s}$  b)  $X(s) = 1 - e^{+2s}$  c)  $X(s) = \frac{1}{s} - \frac{e^{-2s}}{s}$  d) none of these

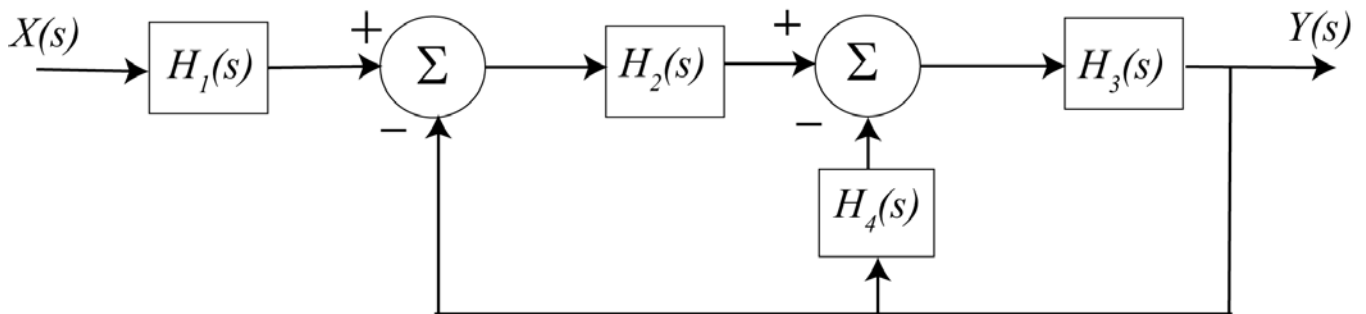
- 13) The Laplace transform of  $x(t) = te^{-3t}u(t)$  is a)  $X(s) = \frac{1}{s} \frac{1}{s+3}$  b)  $X(s) = \frac{1}{s+3}$  c)  $X(s) = \frac{1}{(s+3)^2}$
- d)  $X(s) = \frac{2}{(s+3)^2}$

Problems 14 – 16 refer to the signal flow graph representation of the following block diagram.



- 14) How many **paths** are there? a) 0 b) 1 c) 2 d) 3 e) 4
- 15) How many **loops** are there? a) 0 b) 1 c) 2 d) 3 e) 4
- 16) Are any of the **cofactors** equal to 1? a) yes b) no

For problems 17 – 20 consider the signal flow graph representation of the following block diagram.



- 17) How many **paths** are there? a) 0 b) 1 c) 2 d) 3 e) 4
- 18) How many **loops** are there? a) 0 b) 1 c) 2 d) 3 e) 4
- 19) The **determinant** ( $\Delta$ ) is a) 1 b)  $1 - H_2H_3 - H_3H_4$  c)  $1 + H_2H_3 + H_3H_4$  d) none of these
- 20) The **transfer function** is a) 1 b)  $\frac{H_1H_2H_3}{1 - H_2H_3 - H_3H_4}$  c)  $\frac{H_1H_2H_3}{1 + H_2H_3 + H_3H_4}$