

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:

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

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

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

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

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

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

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?

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

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

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

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

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

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

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

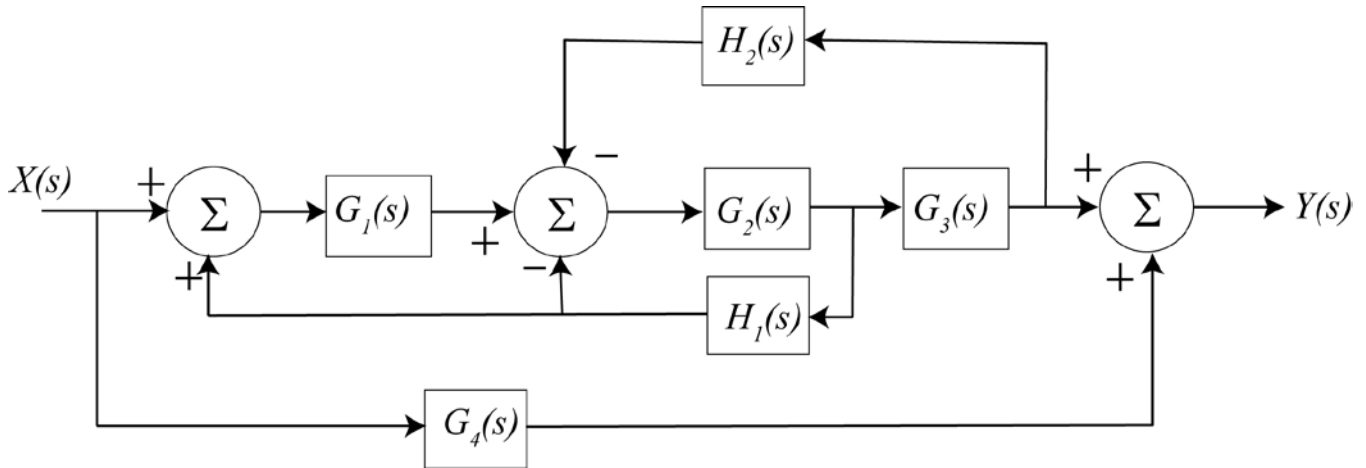
12) The Laplace transform of $x(t) = u(t) - u(t-2)$ is

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) $X(s) = \frac{1}{(s+3)^2}$

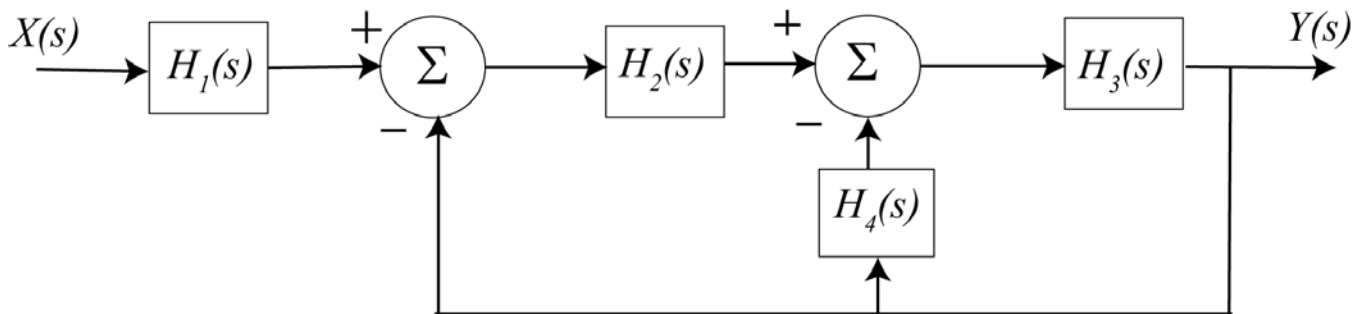
d) $X(s) = \frac{2}{(s+3)^2}$

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** (Δ) 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) $\frac{H_1H_2H_3}{1 + H_2H_3 + H_3H_4}$