ECE-205 Practice Quiz 8

(no Tables, Calculators, or Computers)

Problems 1-3 assume we have a system modeled with the transfer function

$$H(s) = \frac{s+2}{(s+1)(s+3)(s+4)}$$

1) This system model has how many **zeros**? a) 0 b) 1 c) 2 d) 3

2) This system model has how many **poles**? a) 0 b) 1 c) 2 d) 3

3) How many terms will there be in the partial fraction expansion?

a) 0 b) 1 c) 2 d) 3

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

a) 0 b) 1 c) 2 d) 3

For problems 5-7 assume we have a system modeled by the transfer function $H(s)$.

5) To determine the **impulse response** we should compute the inverse Laplace transform of

a) $Y(s) = H(s)$ b) $Y(s) = H(s)\frac{1}{s}$ c) $Y(s) = H(s)\frac{1}{s^2}$ d) $Y(s) = H(s)\frac{1}{s^3}$

6) To determine the **(unit) step response** we should compute the inverse Laplace transform of

a) $Y(s) = H(s)$ b) $Y(s) = H(s)\frac{1}{s}$ c) $Y(s) = H(s)\frac{1}{s^2}$ d) $Y(s) = H(s)\frac{1}{s^3}$

7) To determine the **(unit) ramp response** we should compute the inverse Laplace transform of

a) $Y(s) = H(s)$ b) $Y(s) = H(s)\frac{1}{s}$ c) $Y(s) = H(s)\frac{1}{s^2}$ d) $Y(s) = H(s)\frac{1}{s^3}$

8) For the transfer function

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

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

a) t^2e^{-2t} b) t and te^{-2t} c) 1 and te^{-2t}

d) te^{-2t} e) 1, e^{-2t}, and te^{-2t}

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

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

10) In using partial fractions to go from the Laplace domain to the time domain for a transfer function with no pole/zero cancellations, the number of terms used in the partial fraction expansion is determined by

a) the zeros of the transfer function b) the poles of the transfer function

11) For the transfer function

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

The partial fraction expansion will be of the form

a) $H(s) = \left(\frac{A}{s+1}\right)\left(\frac{B}{s+2}\right)\left(\frac{C}{(s+2)^2}\right)$ b) $H(s) = \frac{A}{s+1} + \frac{B}{s+2} + \frac{C}{(s+2)^2}$

c) $H(s) = \frac{A}{s+1} + \frac{C}{(s+2)^2}$ d) $H(s) = \left(\frac{A}{s+1}\right)\left(\frac{C}{(s+2)^2}\right)$

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

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

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

15) The Laplace transform equivalent impedance of an inductor (assuming the initial conditions are equal to zero) is

a) $Z(s) = \frac{1}{Ls}$ b) $Z(s) = \frac{L}{s}$ c) $Z(s) = Ls$ d) $Z(s) = \frac{s}{L}$

16) The Laplace transform equivalent impedance of a capacitor (assuming the initial conditions are equal to zero) is

a) $Z(s) = Cs$ b) $Z(s) = \frac{C}{s}$ c) $Z(s) = \frac{s}{C}$ d) $Z(s) = \frac{1}{sC}$

Problems 17 and 18 refer to the following transfer function $H(s) = \dfrac{2s+1}{(s+1)^2+4}$

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

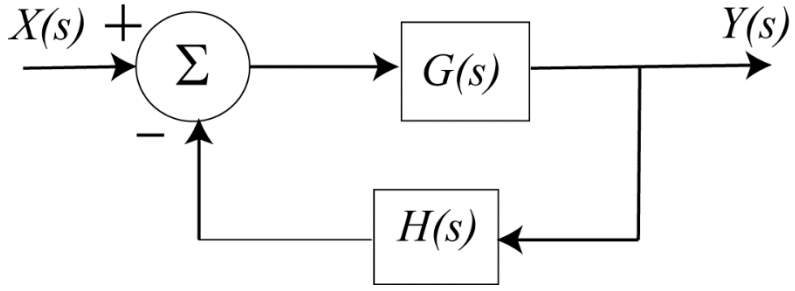
c) $e^{-t}\cos(4t), e^{-t}\sin(4t)$ d) $e^{-4t}\cos(t), e^{-4t}\sin(t)$

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

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

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

For problems 19-23, consider the signal flow graph representation of the following block diagram.



19) The **path** is a) 1 b) G c) H d) GH e) none of these

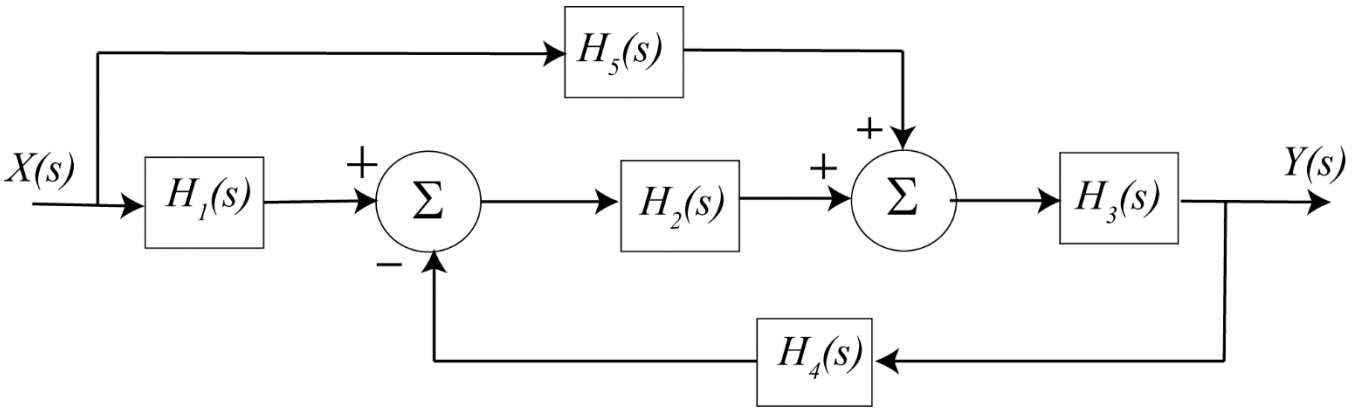
20) The **loop** is a) 1 b) G c) H d) GH e) none of these

21) The **determinant** (Δ) is a) 1 b) 1-GH c) 1+GH d) none of these

22) The **cofactor** is a) 1 b) G c) H d) GH e) none of these

23) The **transfer function** is a) 1 b) G c) GH d) $\dfrac{G}{1-GH}$ e) $\dfrac{G}{1+GH}$

For problems 24-27, consider the signal flow graph representation of the following block diagram.



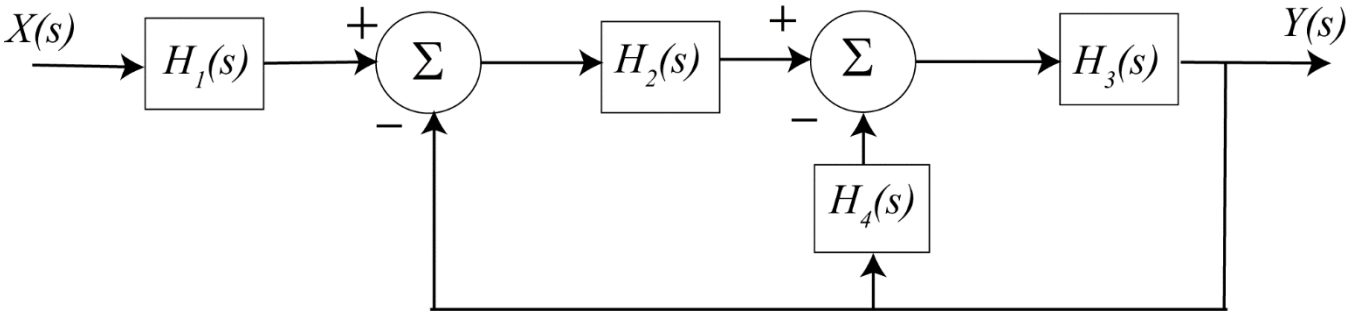
24) How many **paths** are there? a) 0 b) 1 c) 2 d) 3 e) 4

25) How many **loops** are there? a) 0 b) 1 c) 2 d) 3 e) 4

26) The **determinant** (Δ) is a) 1 b) $1-H_2H_3H_4$ c) $1+H_2H_3H_4$ d) none of these

27) The **transfer function** is a) 1 b) $\frac{H_3H_5+H_1H_2H_3}{1+H_2H_3H_4}$ c) $\frac{H_3H_5+H_1H_2H_3}{1-H_2H_3H_4}$

For problems 28 – 31 consider the signal flow graph representation of the following block diagram.



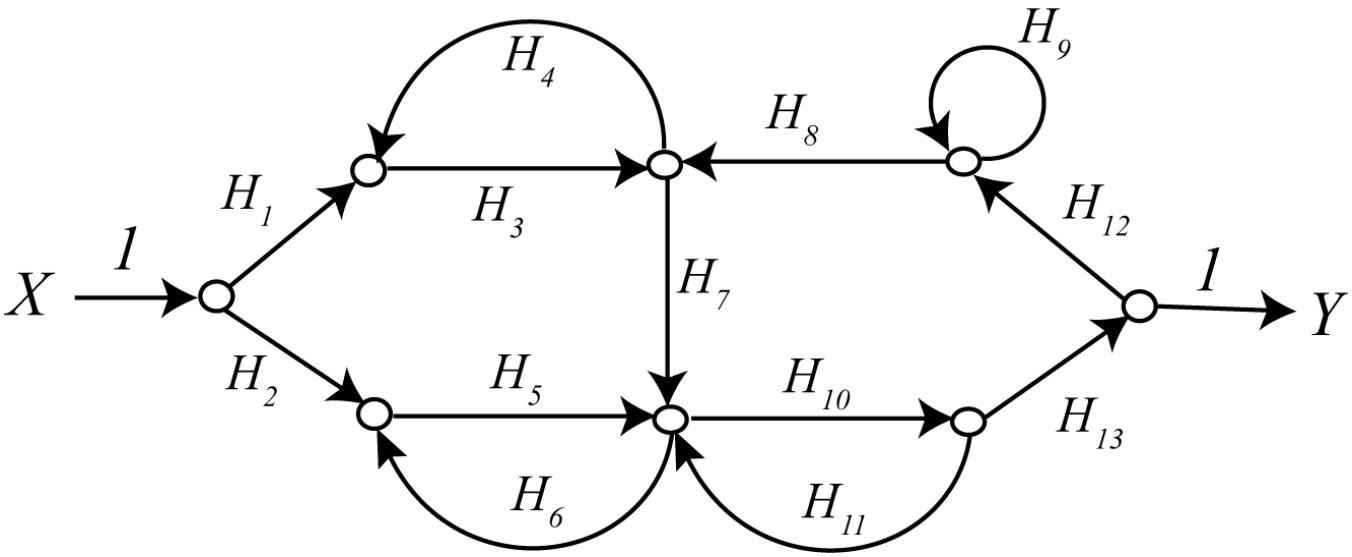
28) How many **paths** are there? a) 0 b) 1 c) 2 d) 3 e) 4

29) How many **loops** are there? a) 0 b) 1 c) 2 d) 3 e) 4

30) 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

31) The **transfer function** is a) 1 b) $\frac{H_1H_2H_3}{1-H_2H_3-H_3H_4}$ c) $\frac{H_1H_2H_3}{1+H_2H_3+H_3H_4}$

For problems 32-34 consider the following signal flow graph



32) How many **paths** are there? a) 1 b) 2 c) 3 d) 4

33) How many **loops** are there? a) 2 b) 3 c) 4 d) 5 e) 6 f) 7

34) Are any of the **cofactors** equal to 1? a) yes b) no

Answers: 1-b, 2-d, 3-d, 4-d, 5-a, 6-b, 7-c, 8-e, 9-b, 10-b, 11-b, 12-c, 13-c, 14-d, 15-c, 16-d, 17-a, 18-c, 19-b, 20-e, 21-c, 22-a, 23-e, 24-c, 25-b, 26-c, 27-b, 28-b, 29-c, 30-c, 31-c, 32-b, 33-d, 34-b