



Islamic University of Gaza
Electrical Engineering Department
EELE 3360 Control Systems
Final Exam
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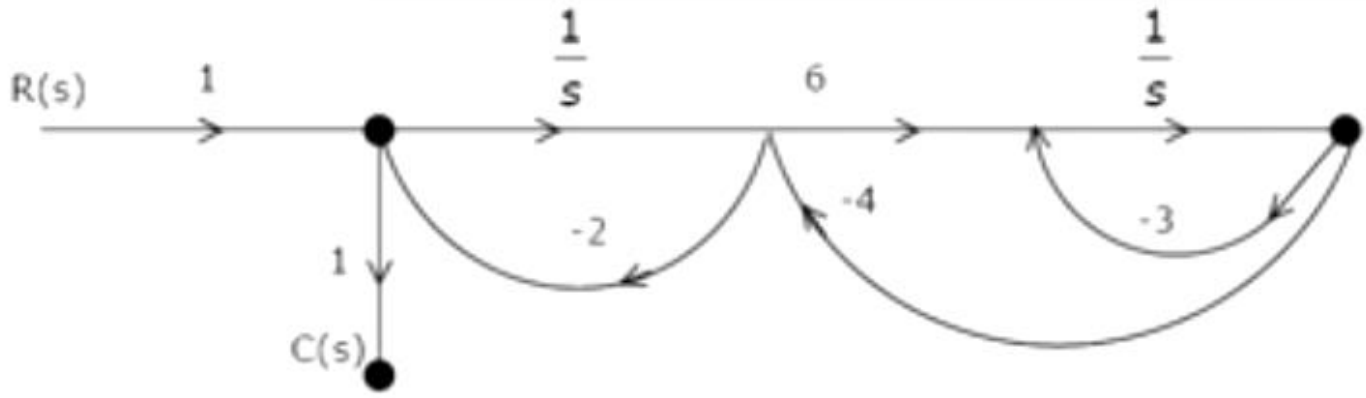
Exam duration 2 Hours

Name	
Student ID	
Grade	

GOOD Luck

Chose the correct answer with an explanation

1. a) The signal flow graph of a system is shown in figure below. The transfer function $C(s)/R(s)$ of the system is (5 PT)



(a) $\frac{6}{s^2 + 29s + 6}$

(b) $\frac{6s}{s^2 + 29s + 6}$

(c) $\frac{s(s+2)}{s^2 + 29s + 6}$

(d) $\frac{s(s+27)}{s^2 + 29s + 6}$

2. b) The zero input response of a system given by state –space equation

(5 PT)

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \text{ and } \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \text{ is}$$

(a) $\begin{bmatrix} te^t \\ t \end{bmatrix}$ (b) $\begin{bmatrix} e^t \\ t \end{bmatrix}$ (c) $\begin{bmatrix} e^t \\ te^t \end{bmatrix}$ (d) $\begin{bmatrix} t \\ te^t \end{bmatrix}$

3. a) A network is described by the state model as

(4 PT)

$$\dot{x}_1 = 2x_1 - x_2 + 3u$$

$$\dot{x}_2 = -4x_2 - u$$

$$y = 3x_1 - 2x_2$$

The transfer function $Y(s)/U(s)$ is

(a) $\frac{11s + 35}{(s - 2)(s + 4)}$

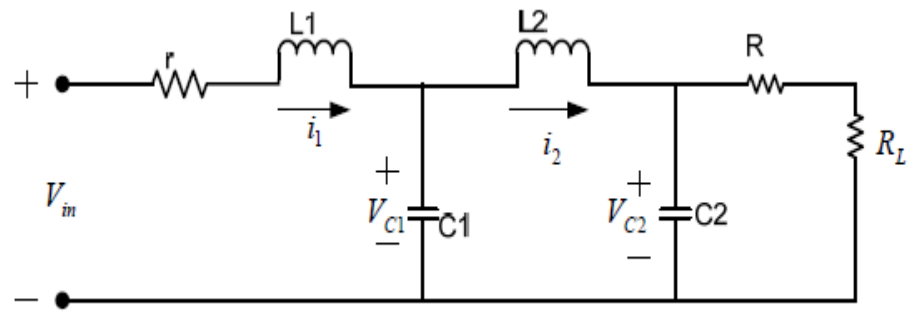
(b) $\frac{11s - 35}{(s - 2)(s + 4)}$

(c) $\frac{11s + 38}{(s - 2)(s + 4)}$

(d) $\frac{11s - 38}{(s - 2)(s + 4)}$

3. b) Find the state equation for the circuit shown below.

(6 PT)



4. A control system with a controller is shown in the figure below. If the velocity error constant $K_v = 1000$ and the damping ratio $\zeta = 0.5$, then the values of K_p and K_D are: (8 PT)



(A) $K_p = 100, K_D = 0.09$

(B) $K_p = 100, K_D = 0.9$

(C) $K_p = 10, K_D = 0.09$

(D) $K_p = 10, K_D = 0.9$

5. A The open loop transfer function of unity feedback system is $G(s) = \frac{K}{s(s^2-s-2)(s-3)}$, the range of K for which the system is stable is (6 Pt)

(a) $\frac{21}{4} > K > 0$ (b) $13 > K > 0$ (c) $\frac{21}{4} < K < \infty$ (d) $-6 < K < \infty$

6. The root locus plot for a system shown in the Figure below. The open loop transfer function corresponding this plot is given by: (6 PT)

(A) $G(s)H(s) = k \frac{s(s+1)}{(s+2)(s+3)}$

(B) $G(s)H(s) = k \frac{(s+1)}{s(s+2)(s+3)^2}$

(C) $G(s)H(s) = k \frac{1}{s(s-1)(s+2)(s+3)}$

(D) $G(s)H(s) = k \frac{(s+1)}{s(s+2)(s+3)}$

