Philadelphia University **Student Name:**

Faculty of Engineering **Student Number:**

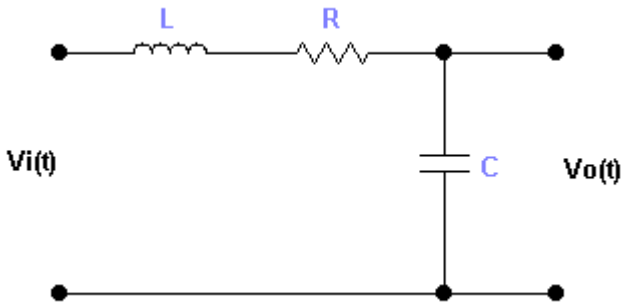
Dept. of Electrical Engineering
Final Exam, Second Semester: 2018/2019

Course Title: Control Systems – sec. 1	**Date: 2/6/2019**
Course No: (610414+640344)	**Time Allowed: 2 hours**
Lecturer: Dr. Mohammed Mahdi	**No. of Pages: 2**

Question 1: ***(25 Marks)***

Objectives: This question is about system modeling.

Given the following RLC circuit: -



It is required to evaluate: -

1. Transfer function $\frac{Vo(s)}{Vi(s)}$. (10 marks)

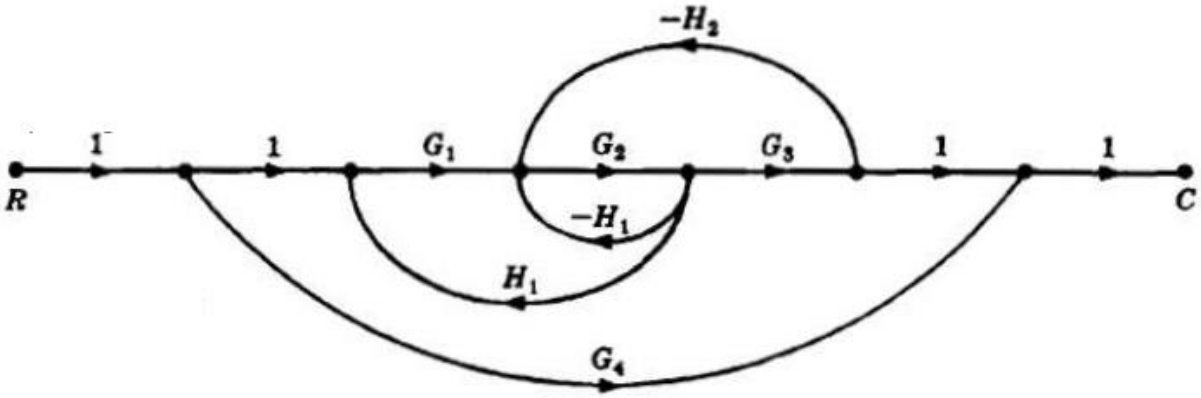
2. Show the possible kind of system output responses. (10 marks)

3. Find system parameters ω_n, ς , k. (5 marks)

Question 2: ***(25 Marks)***

Objectives: This question is about Mason's Gain Formula and time response specifications.

A) Given the following SFG, it is required to apply Mason's Gain Formula to obtain transfer function C(s) / R(s). (15 marks)



B) Derive the general first order system time response for unit step change in input $\frac{Y(s)}{R(s)} = \frac{k}{\tau s+1}$. Then find **y(0), y(τ), and y(∞).** (10 marks)

Question 3: ***(25 Marks)***

Objectives: This question is about absolute stability.

Why do the absolute stability check deal with the characteristics equation?. Then apply **two methods** to check the absolute stability of the following characteristic equation: -

$$P(s) = s^4 + 4 = 0$$

Question 4: ***(25 Marks)***

Objectives: This question is about controller design.

Given the open loop transfer function $G(s) = \frac{5}{(s+20)}$. It is required to design **PI** controller so that the desired closed loop poles are located at **s = - 10 and s = - 20**. Then check your design result.