

科目：控制系統導論

適用：電機系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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編號：345

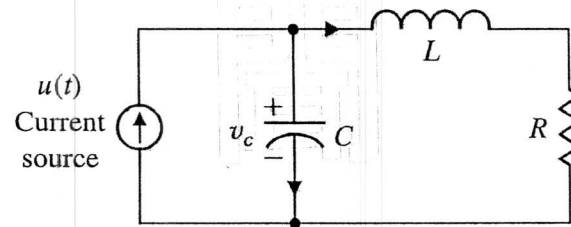
1. (20%) Explain the following terminologies briefly:

- (a) Root locus. (5%)
- (b) Gain margin. (5%)
- (c) Steady-state response. (5%)
- (d) Phase-lag compensator. (5%)

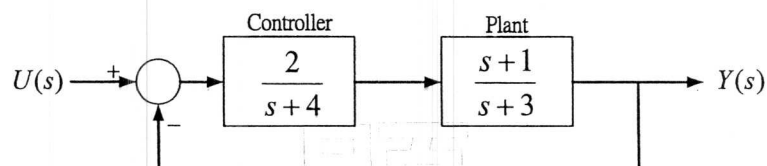
2. (30%) A linear time-invariant system has the state-variable model represented by $\dot{x}(t) = Ax(t) + Bu(t)$ and $y(t) = Cx(t) + Du(t)$, where $x(t)$ is the state vector, $u(t)$ is the input, $y(t)$ is the output, and A , B , C and D are some appropriate constant matrices.

- (a) Determine the transfer function of this system. (10%)
- (b) Find the unit impulse response for this system. (10%)
- (c) Use two methods to analyze and determine the stability of this system. (10%)

3. (30%) Consider the system of a *RLC* network as follows:



- (a) Determine the transfer function from the current source input $u(t)$ to the output $v_c(t)$, which is the voltage across the capacitor. (10%)
 - (b) Determine the conditions for R , L and C to result in a zero-overshoot system response with the rapidest rise time for a unit step input. (10%)
 - (c) Determine the conditions for R , L and C to yield an oscillator circuit. Explain the meanings of your answer briefly. (10%)
4. (20%) The block diagram of a feedback control system with the input $U(s)$ and the output $Y(s)$ is shown in the following:



- (a) Determine the corresponding state variable model for this system in diagonal canonical form. (10%)
- (b) Find the zero-state response of this system to a unit step input. (10%)