

國立臺北科技大學 100 學年度碩士班招生考試

系所組別：1420 能源與冷凍空調工程系碩士班乙組

第二節 自動控制 試題

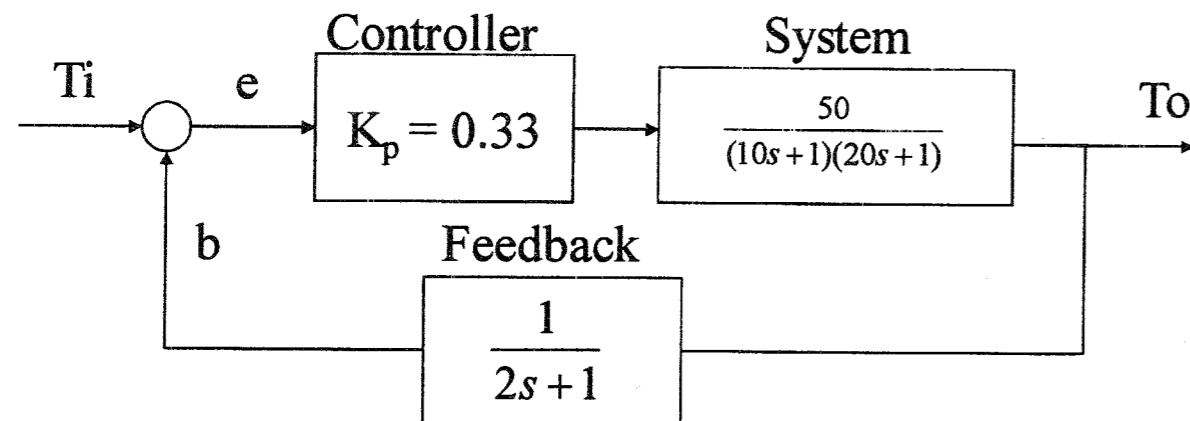
第一頁 共一頁

注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Laplace transform is the fundamental for analyzing control system. Write down the formal definition of this integral transform in parameters, time t , complex number s , and functions of $f(t)$ and $F(s)$ (10 pts). The most significant advantage of Laplace transform is that differentiation and integration become multiplication and division, respectively, by s . Illustrate the proofs of the Laplace transform of a function's derivative and integral (each 5 pts, total 10 pts).

2. A control system is expressed by the following figure in parameter, s .



Write down its transfer function (5pts) and judge if it is stable (5 pts). If T_i suddenly rises to a constant, T , will T_o become T in a long period or not (5 pts)? Explain why (5 pts)?

3. A control system can be expressed by state space as shown in following:

$$\dot{X}(t) = AX(t) + Bu(t)$$

$$Y(t) = CX(t) + Du(t)$$

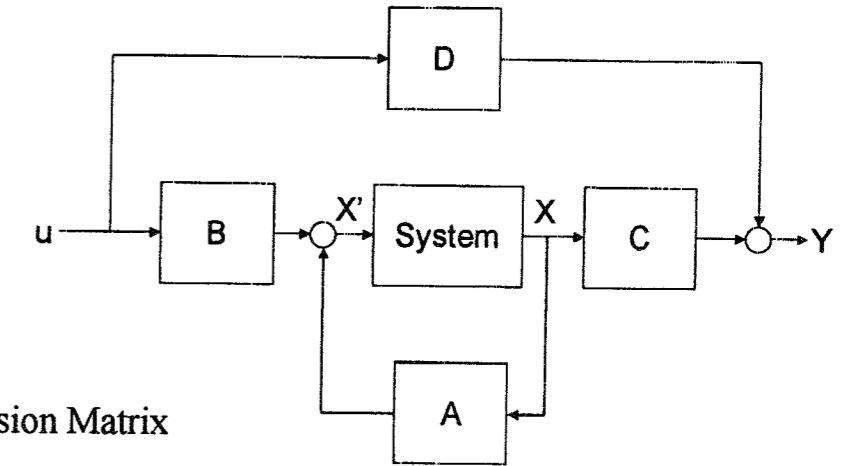
where

$A_{n \times n}$: System Matrix

$B_{n \times p}$: Input Matrix

$C_{q \times n}$: Output Matrix

$D_{q \times p}$: Direct Transmission Matrix



If a fan coil system is simulated by this model and X denotes the rotational speed of fan, explain who input $u(t)$ changes output $Y(t)$ (10 pts) and give a proper prediction of matrix, D (10 pts).

4. What's wireless sensor network and what's the most popular communication protocol used for wireless sensors (10 pts)? How is it applied to a modern air conditioning system (5pts)? Does it really improve energy efficiency for climate control in your opinion (5pts)?

5. Describe working principals of inverter control for an air conditioner (10pts). Using pressure-enthalpy diagram to explain how inverter control changes the cooling capacity for energy saving (10 pts).