

國立臺北科技大學九十五學年度碩士班招生考試

系所組別：1412 能源與冷凍空調工程系碩士班甲組

第二節 自動控制（選考）試題

填准考證號碼

第一頁 共二頁

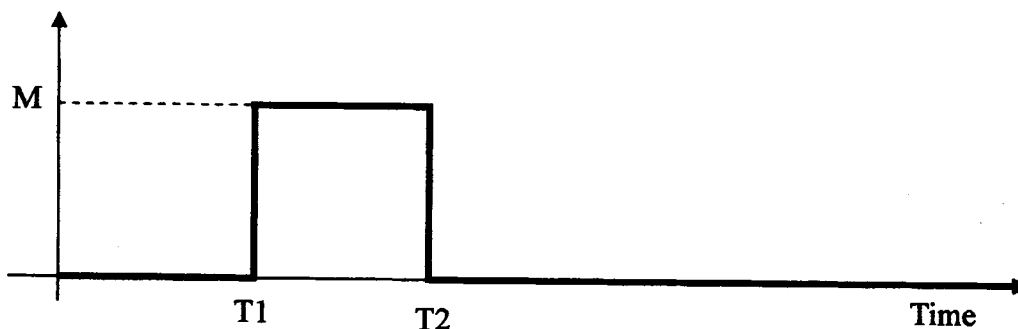
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注意事項：

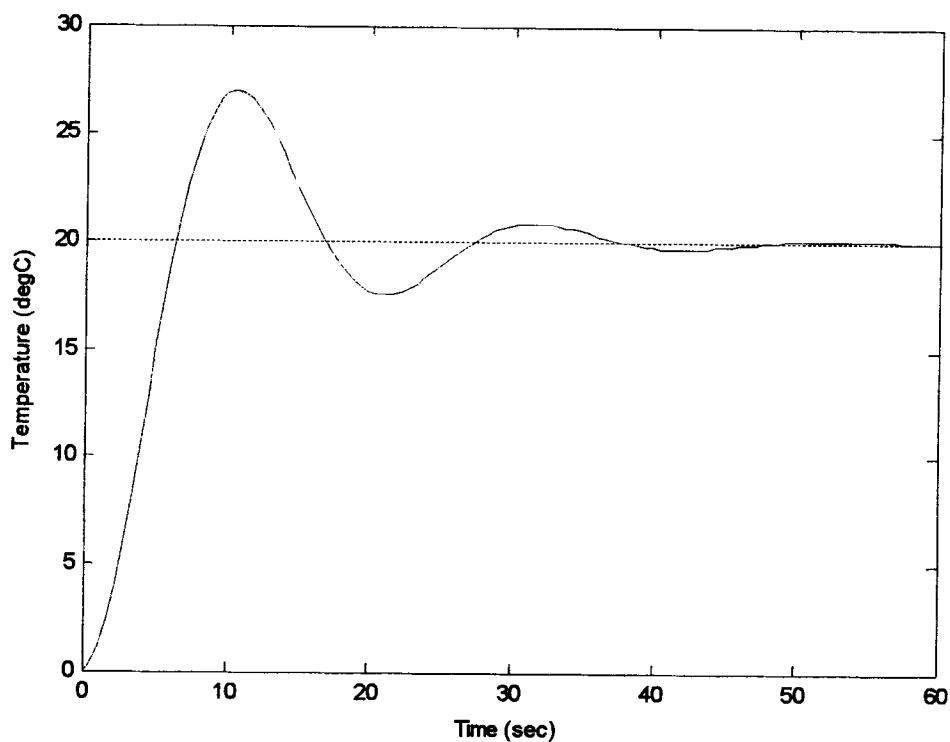
1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (a) What kind of dynamic system can be modeled by a transfer function? (10 分)
 (b) Given a system $y'(t) + ty(t) = u(t)$, can you obtain the transfer function? If the answer is positive, please write down the transfer function. If negative, please explain why.
 (10 分)
2. The temperature time variation of an air-conditioned room with constant fresh air ventilation can be simulated by the following parameters: ρ is the air density, V is the room volume, c_p is the constant pressure specific heat of the air, \dot{m} is the ventilation rate, q is the controllable cooling capacity of the air-conditioner, T_{amb} is the ambient temperature and T is the room temperature. If any other else, you can add to the equation by yourself. Write the system governing equation and derive the transfer function. (20 分)

3. A signal $e(t)$ can be shown in the following figure. Calculate the Laplace transform of this signal. (20 分)



4. Write the transfer function of the PID controller. In designing a PID controller for temperature control, what's your major concern? If a PID controller is employed for air conditioner control, what control scheme makes the room temperature variation and how to improve this response? (20 分)



注意：背面尚有試題

5. A dynamic equation of a system of a linear system can be expressed by

$$\mathbf{X}'(t) = \mathbf{A}\mathbf{X}(t) + \mathbf{B}u(t)$$

$$\mathbf{Y}(t) = \mathbf{C}\mathbf{X}(t) + \mathbf{D}u(t)$$

where $\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}$ are the system matrix, input matrix, output matrix and direct transmission matrix respectively. $u(t)$ is the system input, $\mathbf{Y}(t)$ is the output and $\mathbf{X}(t)$ is the state vector.

Determine the transfer function $\frac{\mathbf{Y}(s)}{u(s)}$ based on the matrix described above. (20 分)