編號： 288　系所：製造工程研究所甲組　　科目：自動控制

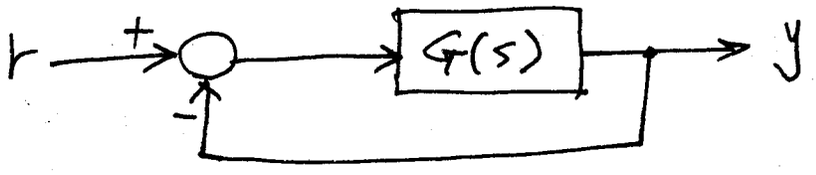
本試題是否可以使用計算機：☑可使用，☐不可使用　（請命題老師勾選）

1. For the following transfer function

$$\frac{Y(s)}{R(s)} = \frac{3(s+2)}{(s+k)(s+1)^2}$$

find the system response to a unit step input. (20%)

2. Find the range of K over which the following system is stable. (20%)



$$G(s) = \frac{K(s+6)}{s[(s+0.5)(s+1)(s^2+0.6s+6)]}.$$

3. Consider a unity-feedback control system with open-loop transfer function G(s) given by:

$$G(s) = \frac{0.6s+1}{s(s+0.6)}$$

Find the closed-loop system response to a unit step then compute the rise time and percent overshoot. (20%).

（背面仍有題目，請繼續作答）

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4. Consider the system (F, G, H) with

$$F = \begin{bmatrix} -2 & 0 \\ 0 & -3 \end{bmatrix}, \quad G = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \text{ and } \quad H = \begin{bmatrix} -1 & 2 \end{bmatrix}.$$

(a) Calculate the transfer function $G(s)$. (5%)

(b) Suppose that we want to shift the poles from $-2, -3$ to $-1, -10$ by using linear state feedback $u = K\mathbf{x}$ (where K represents feedback gain matrix and $\mathbf{x} = [x_1 \quad x_2]^T$ are the state variables). Find K. (15%)

5. Consider the system shown below. Determine the transfer matrix of the series compensator (G_c) such that the closed-loop transfer matrix is

$$G(s) = \begin{bmatrix} \frac{1}{s+1} & 0 \\ 0 & \frac{1}{5s+1} \end{bmatrix}. \quad (>0\%)$$