

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. A control system is shown in Fig.1. Please find the followings:

(1) $G(s) = X(s) / T(s)$ (10%)

(2) Damping ratio ζ (5%)

(3) T_r (Rising Time) (5%)

(4) T_p (Peak Time) (5%)

(5) T_s (Settling Time) (5%)

(6) M_p (Overshooting Max) (5%)

(7) $ess(\infty)_{step}$ (5%)

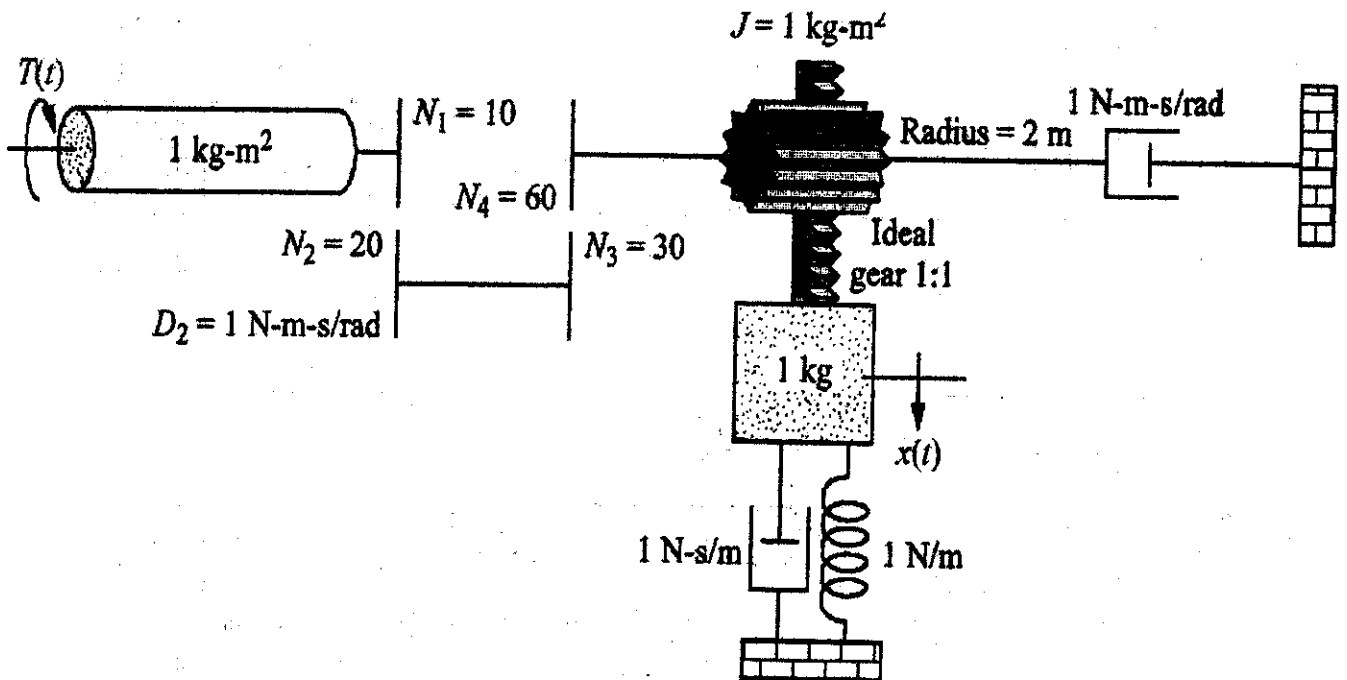


Fig. 1

(背面仍有題目,請繼續作答)

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2. Find the following for the system shown in Fig.2 & Fig.3

- (1) Gain margin (10%)
- (2) Phase margin (10%)

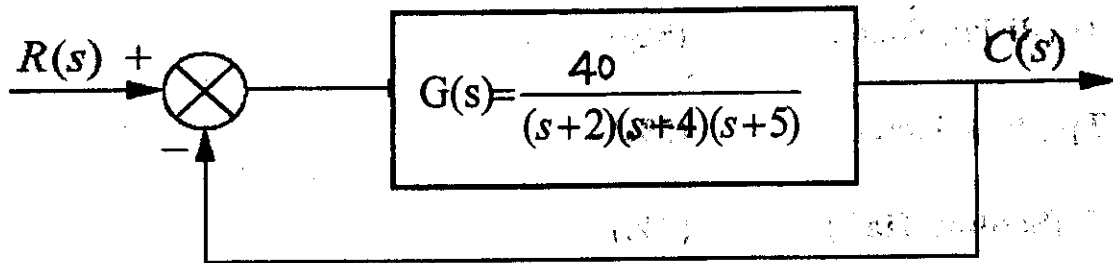


Fig.2

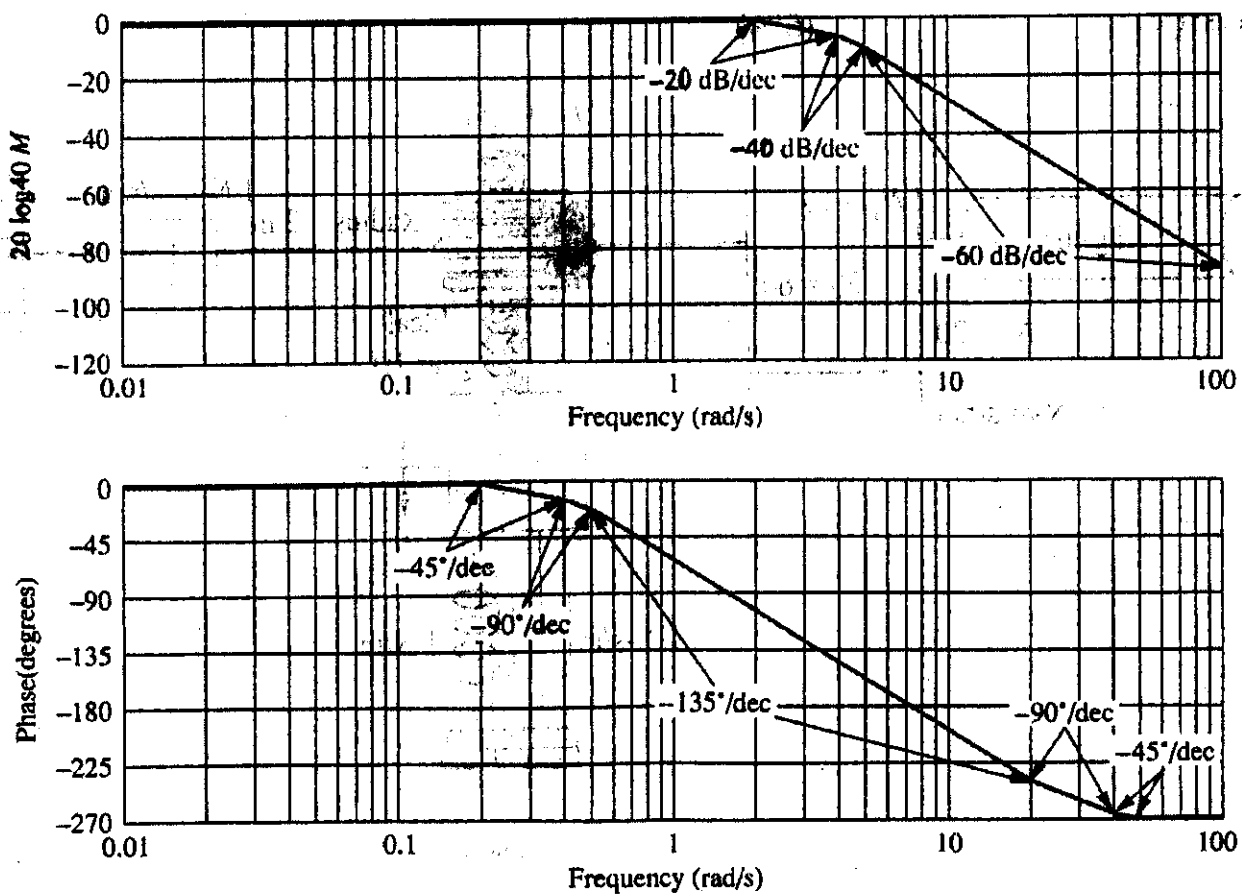


Fig.3. Bode diagram

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3. Given a control system shown in Fig.4, find the following for the system.

- (1) Sketch the root locus for the system (10%)
 (2) For the stability, find the range of K (10%)

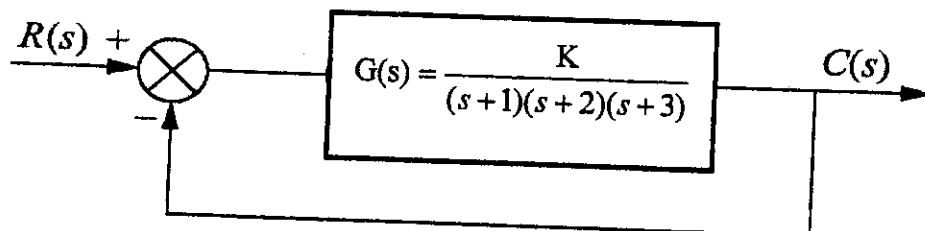


Fig.4

4. Determine whether the following control system is observable (10%)

$$\dot{x} = Ax + Bu = \begin{bmatrix} -2 & -1 & -3 \\ 0 & -2 & 1 \\ -7 & -8 & -9 \end{bmatrix} x + \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} u$$

$$y = Cx = \begin{bmatrix} 4 & 6 & 8 \end{bmatrix} x$$

5. Please explain the method (or theory) for deciding the stability of a control system by using the Nyquist Diagram. (10%)