國立中央大學八十四學年度碩士班研究生入學試題卷

參考用

所別：電機工程研究所　丙組　　科目：控制系統　　共 2 頁 第 1 頁

1. Given the following block diagram in Fig. 1, explain succinctly why the goal of reduced sensitivity to output disturbances D conflicts with the goal of attenuation of sensor noise N. How is the conflict usually resolved ? (20%)

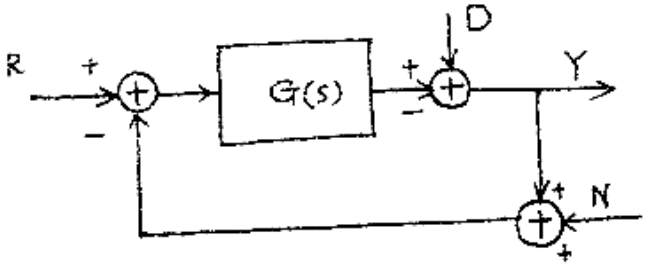

Fig. 1

2. For the two systems below, which one will have the greater percent overshoot and why ? (10%)

(i) $G_a(s) = \dfrac{1}{s^2+1.4s+1}$

(ii) $G_b(s) = \dfrac{4}{s^2+4s+4}$

3. A plant is modeled by $G_p(s) = \dfrac{3}{s+1}$, but in reality the plant contains unmodeled dynamics and its transfer function is

$$\tilde{G}_p(s) = \frac{15(s+5)}{(s+1)(s^2+3s+25)}$$

Find the additive perturbation $L_a(s)$ and the multiplicative perturbation $L_m(s)$ for this case. (20%)

4. Essay Question "Good things happen when the loop gain is large."
Explain what good things happen and why. (you should have 4 good things in your list.)
Explain any bad things than can happen. (you should have 3 bad things in your list.) (10%)

參考用

5. In the system of Fig.2, write state equations for the system such that $x_1(t)$ is the state for the upper block and $x_2(t)$ is the state for the lower block.

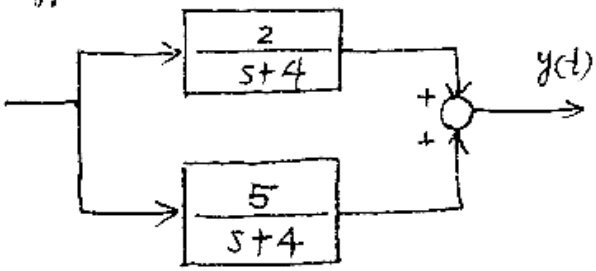

Fig.2

(a) Determine if this system is controllable

(b) Determine if this system is observable.

(c) Explain the results of (a) and (b) from the characteristics of the system (note the mathematics) (30%)

6. In Fig.3 are Nyquist plots of the loop gains of two systems in the G configuration. Assume that each loop gain has no right half-plane poles or zeros except at the origin where each loop gain has one pole. Answer the following questions with a short explanation.

(a) The closed-loop system corresponding to which Nyquist plot is more oscillatory and why ? (5%)

(b) Which system has a larger gain margin and why ? (5%)

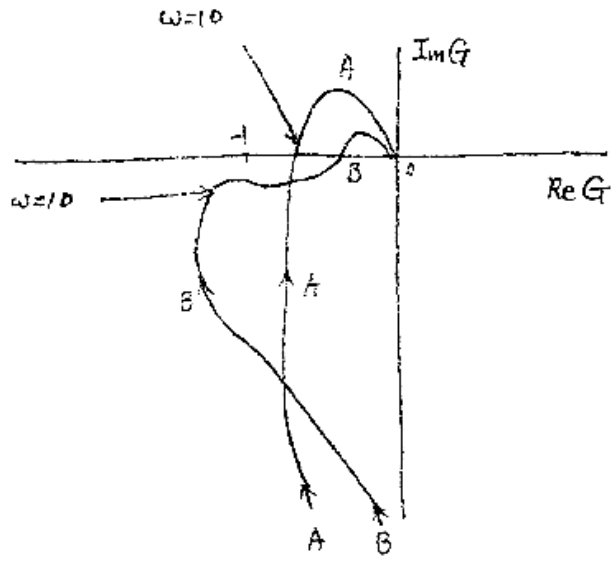

Fig.3