

國立臺灣科技大學

九十學年度碩士班招生考試試題

系所組別： 工程技術研究所自動化及控制學程丙組

科 目： 控制系統

總分為100分，題號請標示清楚

1. Describe the difference between an open-loop control system and closed-loop control system on construction, cost, stability, sensitivity, and effect of external disturbance. (10%)
2. State the role and importance of sensors in a control system. (10%)
3. Use the Routh criterion to investigate the stability of the following characteristic equations. (10%)
 - (1) $s^4 + 3s^3 + 2s^2 + 10s + 2 = 0$
 - (2) $s^3 + 2s^2 + s + 2 = 0$
4. For a Laplace-transformed function $Y(s)$ of $y(t)$, state how to find the initial value $y(0)$ and the final value $y(\infty)$ if it exists. (10%)
5. Consider that an open-loop transfer function of a control system with unity feedback is given by $G(s) = \frac{k}{s(2+s)(8+s)}$ (20%) Note: $\log 2 = 0.301$ $\log 3 = 0.477$
 - (1) For $k = k_0$, the bode diagram is shown in figure 1. The phase-crossover frequency ω_c is 4 rad/s and the magnitude of $G(j\omega_c)$ is 0.1. The phase of $G(j\omega)$ at gain-crossover frequency 0.905 rad/s is -122.11 degrees. Find k_0 and phase margin. (5%)
 - (2) For $k = k_0$, find the gain margin and explain its meaning (5%)
 - (3) Find the range of k for system stability from the gain margin obtained in (2). (4%)
 - (4) For $k = 64$, redraw the bode diagram and find new gain margin (6%)

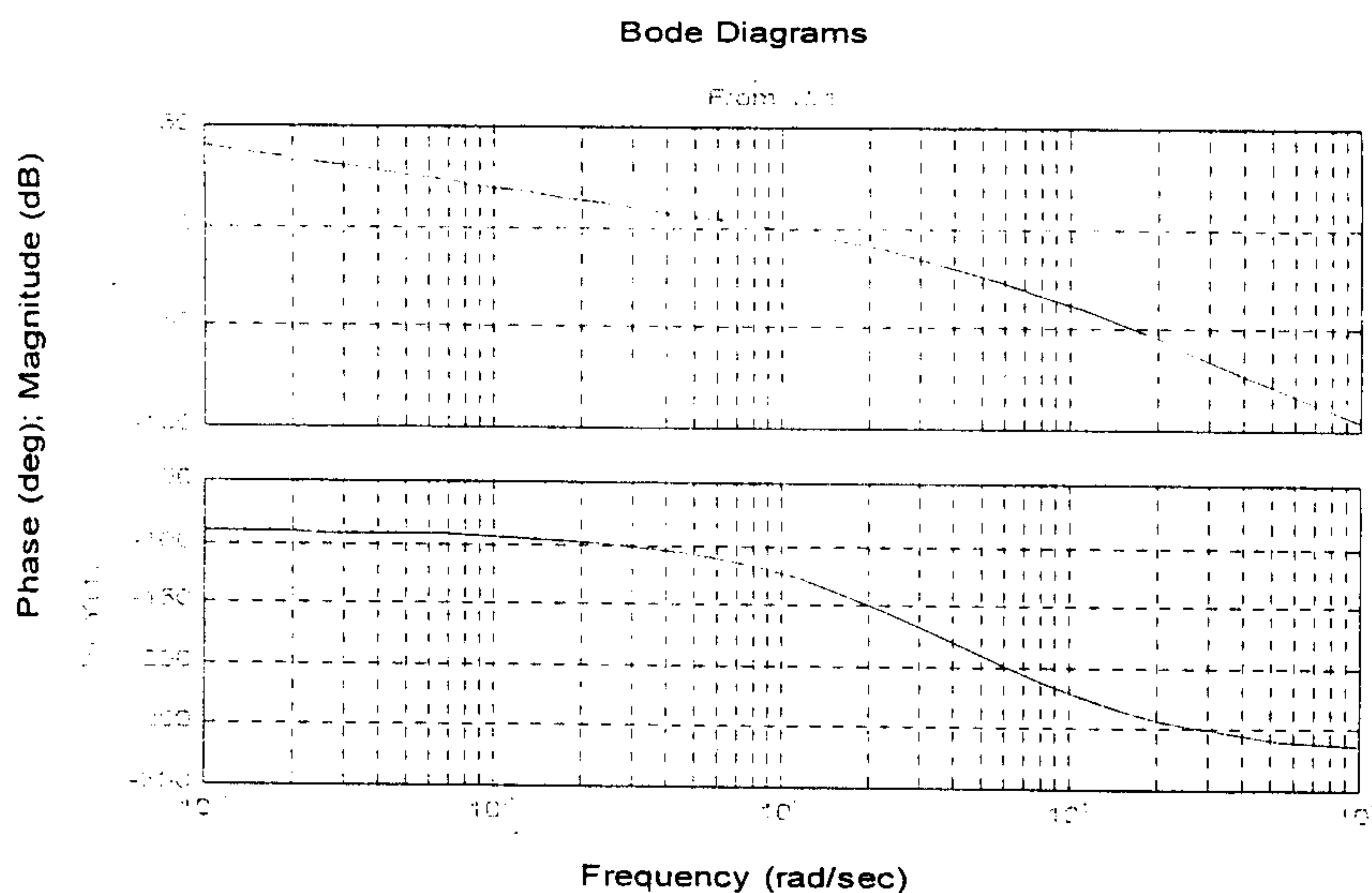


Figure 1



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6. (1) State how a computer system can be applied in designing or analyzing a control system? (10%)
(2) To draw the nyquist diagram for an open-loop transfer function of a control system with unity feedback is given by $G(s) = \frac{k}{s(1+s)(5+s)}$, design a software flow chart for calculating and drawing the nyquist diagram. (10%)
7. 名詞解釋(20%)
- (1) Controllability
 - (2) Observability
 - (3) Eigenvalue
 - (4) Steady-state error
 - (5) Adaptive control



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