

國立中央大學100學年度碩士班考試入學試題卷

所別：電機工程學系碩士班 系統與生醫組(一般生)

科目：控制系統

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本科考試禁用計算器

*請在試卷答案卷(卡)內作答

參考用

1. Consider a plant not denoted in phase-variable form,

$$\dot{z} = Az + Bu$$

$$y = Cz$$

where controllability matrix is C_x . Assume that the system can be transformed into the phase-variable form with the transformation $z = Px$, whose controllability matrix is C_x . Show that

$$P = C_x C_x^{-1}. (25\%)$$

2. Show that observability is preserved when output feedback is used. (25%)

3. Answer the following questions

- 1) How do you decide the breakin and the breakaway points of the root locus? (10%)
- 2) How do you determine the intersections of the root locus and the damping line? (10%)
- 3) How do you check that a root locus lies in the real axis? (5%)

4. Show that the Nyquist stability criterion

$$Z = N + P$$

where N is the number of clockwise encirclements of the critical point -1 made by the $G(s)H(s)$ locus of the Nyquist plot; P is the number of poles of $G(s)H(s)$ enclosed by the Nyquist contour (A contour that encloses the entire right half of the s -plane is called the Nyquist contour); Z is the number of zeros of $G(s)H(s)$ enclosed by Nyquist contour. (25%)