

國立中央大學八十五學年度碩士班研究生入學試題卷

所別: 電機工程研究所 丙組 科目: 控制系統 共 2 頁 第 1 頁

1. What is the steady-state response of the system with the transfer function $\frac{1}{s^2 + 2s + 1}$ due to the input $u(t) = 2 \sin 2\pi t$, for $t \geq 0$.

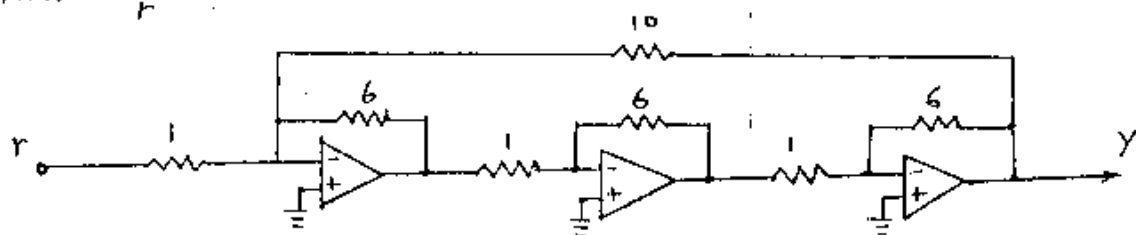
10%

2. Find the range of β_0 so that the position error of the transfer function $\frac{\beta_0}{s^2 + 2s + 2}$ is smaller than 5%.

10%

3. Find $\frac{Y}{r}$:

10%

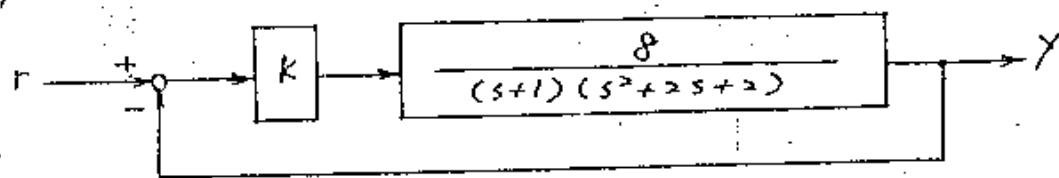


4. When will a system be completely characterized by its transfer function $G(s) = \frac{N(s)}{D(s)}$?

10%

5. Find the stability range of k in the following system.

10%



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6. Modify the Routh criterion so that it applies to the case where all the poles are to be to the left of $-\alpha$ when $\alpha > 0$.
Apply the modified test to the polynomial

$$s^3 + (6+K)s^2 + (5+6K)s + 5K = 0$$

finding these values of K for which all poles have a real part less than -1 . (15%)

7. Under what condition does the following expression exist? please give an example to illustrate.

$$\mathcal{F}[e(t)u(t)] = \mathcal{L}[e(t)u(t)] \Big|_{s=j\omega}$$

where \mathcal{F} denotes the Fourier transform operator, \mathcal{L} denotes the Laplace transform operator, $e(t)$ is any time function, $u(t)$ is unit step function, and $j = \sqrt{-1}$. (15%)

8. For the following figure, determine the range of K for which the system is stable. (20%)

