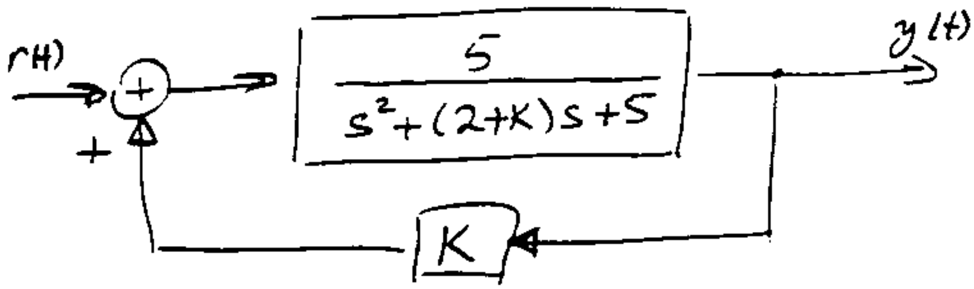
EE 231 **Exam#3** **Dec. 12, 1991**

75 minutes

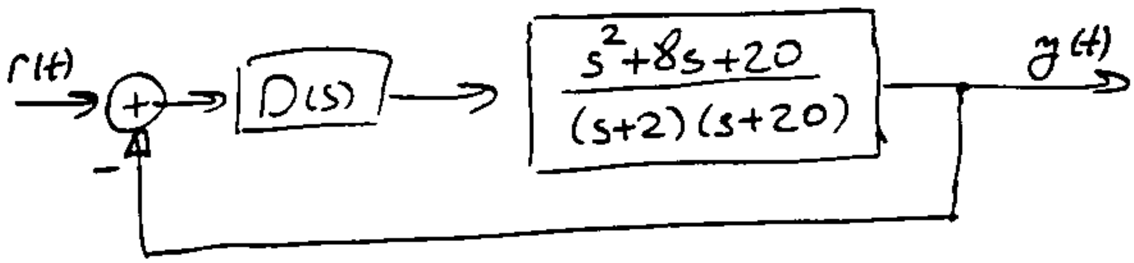
1. Consider the following positive feedback system.



(a) Construct the root-locus diagram as K goes from 0 to ∞. (10pts)

(b) Construct the root-locus diagram as K goes from 0 to $-\infty$. (15pts)

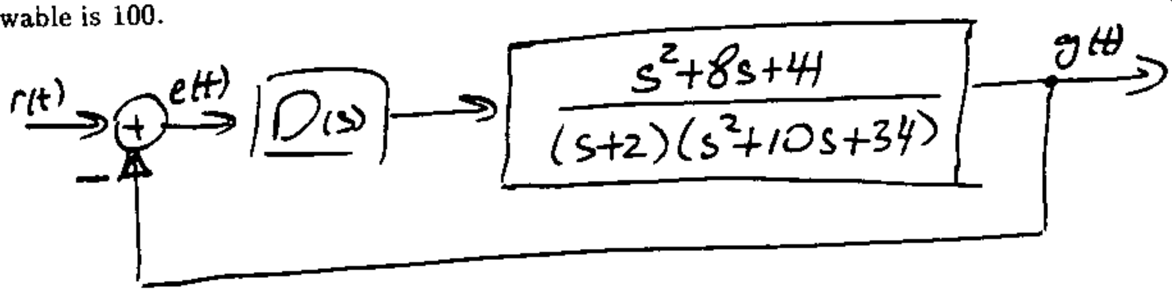
2. A compensator $D(s)$ needs to be designed for the following system, such that the steady-state error is zero for a step input, and the complex closed-loop poles are at $s = -3 \pm j$.



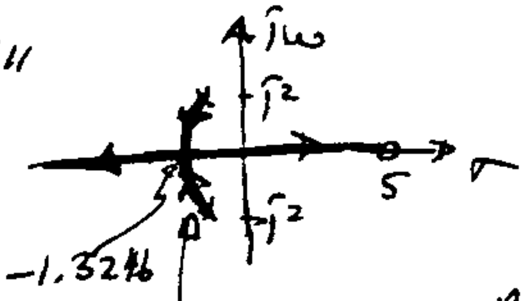
(a) Design a $D(s)$, where the order of the closed-loop system is at most three. (25pts)

(b) Design a $D(s)$, where the steady-state error is (almost) minimum. (25pts)

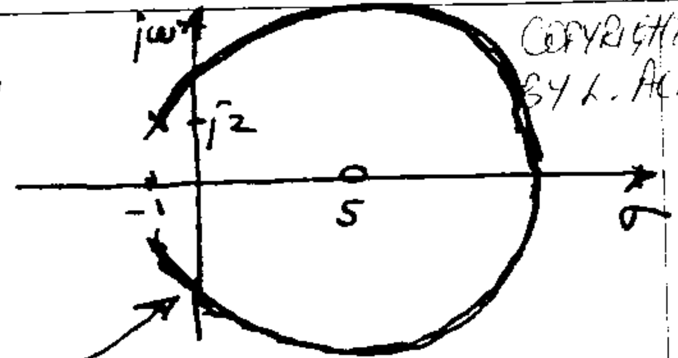
3. For the following system, design a first-order compensator $D(s)$, such that the steady-state error $e(\infty)$ for a step input is reduced by half. Here, assume that the largest finite compensator time-constant allowable is 100. (25pts)



#1 a)



b)



arc of a circle with radius = 5

#2 a) $D(s) = 18.125 \dfrac{s+2}{s(s+4.125)}$

b) $D(s) = 24.1136 \dfrac{s+2.234}{s(s+4.477)}$

#3 $D(s) = \dfrac{s+0.04}{s+0.01}$