2123
B.E. (Electrical and Electronics Engineering)
Fifth Semester
PC-EE-502: Control Engineering - II

Time allowed: 3 Hours   Max. Marks: 50

NOTE: Attempt _five_ questions in all, including Question No. I which is compulsory
and selecting two questions from each Part.

x-x-x

1. Attempt the following:-

(a) Define state and state variables of control system.

(b) Explain differential gap of ON/OFF controller.

(c) Write effects of lead compensator.

(d) Discuss applications of digital control systems.

(e) Prove: $\phi(t_1+t_2) = \phi(t_1) * \phi(t_2)$

(5 * 2)

PART-A

2. (a) Construct state model for $\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = u$
Also, draw block diagram.
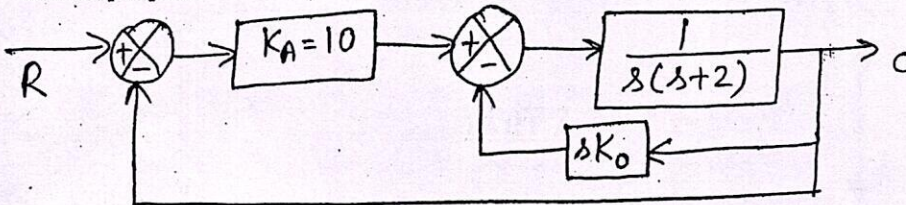
(b) $\dot{x} = \begin{bmatrix} -1 & -4 & -1 \\ -1 & -6 & -2 \\ -1 & -2 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u$

$y = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix} x$

Find transfer function and signal flow graph.

(5, 5)

3. (a) For the following system, in absence of derivative feedback ($K_o = 0$), find δ and ω_n. Also, find e_{ss} for unit ramp input.

Again, determine derivative feedback constant K_o, that will make $\delta = 0.6$. Find e_{ss} for unit ramp input.

(b) Discuss tuning of PID controller. Explain any one method for it.

(5, 5)

4. Explain designing of Lag Compensator using Frequency domain approach. Clearly explain all the steps with one example.
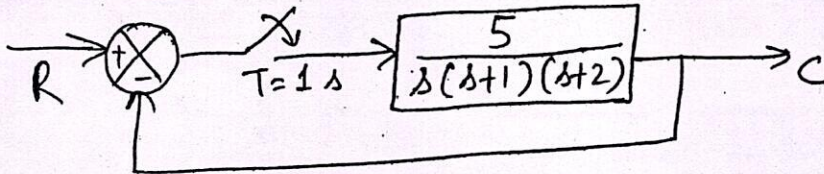
(10)

P.T.O.

PART- B

5. For the following system, find pulse transfer function and stability using bilinear transformation.

R ⊗(+/-) → /T=1s → $\dfrac{5}{s(s+1)(s+2)}$ → C

(10)

6. (a) Find pulse transfer function if sampler is provided only at input signal of closed loop control system.

(b) Find F(z) if $f(t) = e^{-at} \sin \omega t$

(5, 5)

7. Discuss significance of programmable logic control in digital control systems.

(10)

x-x-x