AB 26/05/09 BE(E) sem VII (Rev)

Control Sys - II

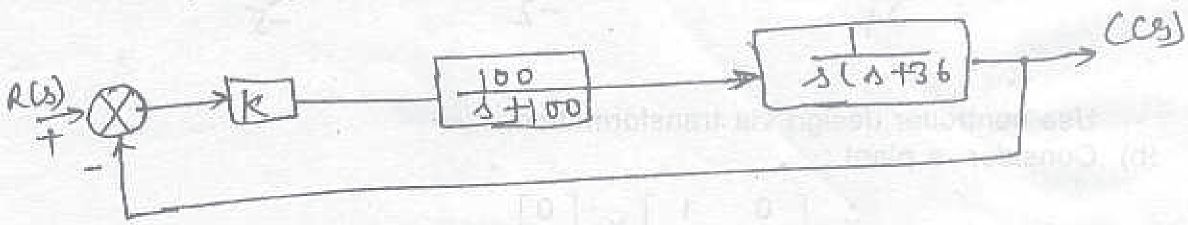
Con. 3253-09. **VR-4704**

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory.**
(2) Attempt **five** questions **only.**
(3) Make any **suitable** assumption wherever **required.**

1. (a) Explain different type of controller configuration. 5
(b) Derive the transfer function from state space equation. 5
(c) Explain the advantages of state space design method. 5
(d) Explain controllability and observability. 5

2. For the system given below : 20



Use bode diagram to design a lag compensator to yield a ten fold improvement in steady state error over the gain compensated system while keeping the percent overshoot at 9·5%.

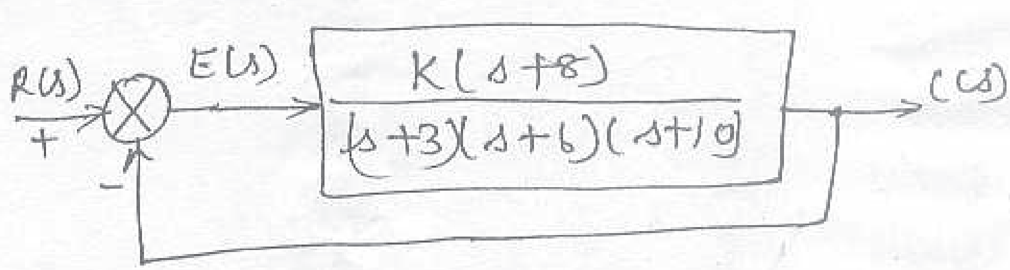
3. (a) Consider a unity feedback control system whose feedforward transfer function is given by $G(s) = \dfrac{15}{s(s+3)(s+9)}$. 15
Design a compensator such that the dominant closed loop poles are located at $-2 \pm j2\sqrt{3}$ and $K_V = 80\ \text{sec}^{-1}$. Use root locus method.
(b) What is estimator ? Explain its need in control system. 5

4. Given the transfer function of a system— 20

$$\frac{Y(s)}{U(s)} = \frac{2s^2 + 6s + 5}{(s+1)^2(s+2)}$$

Draw its phase variable form, controller form, observer form and parallel form representation in state space.

5. Design a PID controller for system given so that the system can operate with a peak time that is two-third of the uncompensated system at 20% overshoot and with zero steady state error for step input. 20



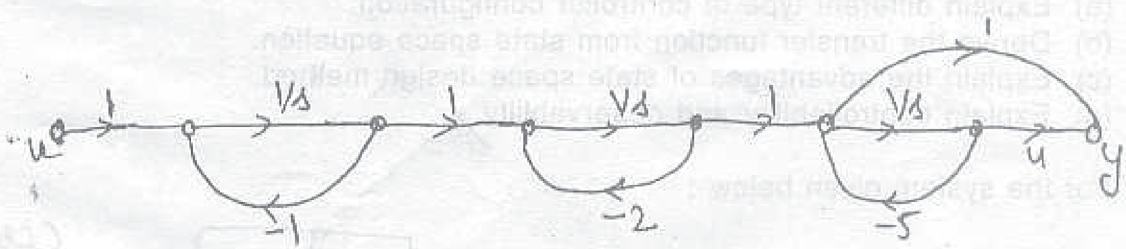
Use Root locus technique.

[TURN OVER

6. (a) Design a state variable feedback controller to yield 20% overshoot and a settling time of 5 sec for a plant. 15

$$G(s) = \frac{s+4}{(s+1)(s+2)(s+5)}$$

represented in cascade form



Use controller design via transformation.

(b) Consider a plant : 5

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

Design a integral controller to yield a 12% overshoot and settling time of 0·6 sec.

7. Write short notes on any **four** :— 20

(a) Stability in digital control
(b) Rate feedback control system
(c) Sample and Hold circuit
(d) PID controller
(e) Anti-alias prefilter
(f) Random effect.