

Roll No.

B.Tech. Examination 6th Semester
CONTROL SYSTEM ENGINEERING
(EL-304)

Time : 3 Hours]

[Max. Marks : 60

Instructions :

Question 1 is compulsory. Attempt four questions from Part-II
Assume any missing data.

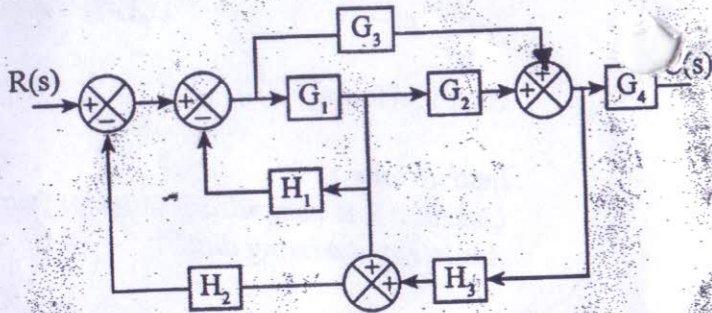
PART-I

1. (a) Write the characteristics of negative feedback. (2)
- (b) The damping ratio and undamped natural frequency of a second order system are 0.5 and 5. Calculate resonant frequency. (2)
- (c) Draw the frequency response of lead compensator. Explain why lag compensator is not suitable for higher order systems. (2)
- (d) What is the value of gain K at any point on root locus? (2)
- (e) What are dominant poles and zeros? (2)
- (f) How will you determine closed loop stability from open loop? (2)
- (g) What are the two limitations of Routh Hurwitz criterion? (2)

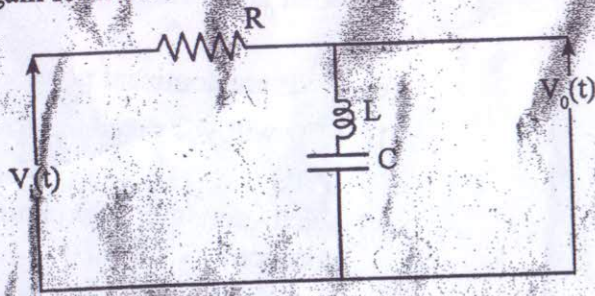
- (h) How is system stability related to pole location? (2)
 (i) Explain how gain margin and phase margin is determined using polar plot? (2)
 (j) Explain servomechanism of control system. (2)

PART-II

2. (a) Obtain the simplified block diagram. (5)



- (b) A unity feedback system has the forward transfer function $G(s) = Ks / (1 + s)^2$. For the input $r(t) = 1 + 5t$ find the minimum value of K so that the steady state error is less than 0.1. (5)
3. (a) Briefly explain the step response analysis of second order system. (5)
 (b) Find the transfer function of the network using Mason's gain formula. (5)



4. (a) Determine the range of K for stability and frequency of sustained oscillations when system is marginally stable for unity feedback system having (6)

$$G(s) = K / (s + 1)^2 (s + 3).$$

- (b) Explain the procedure for phase lead network. Write the effects and limitations of phase lead network. (4)

5. (a) For the following transfer function draw the bode plot and find the gain and phase margin. (8)

$$G(s)H(s) = 40 / s^2(s + 1)(s + 5)$$

- (b) Discuss the effect of feedback on sensitivity of system. (2)

6. (a) A positive feedback system has open loop transfer function (6)

$$G(s)H(s) = K(s + 2) / (s + 3)(s^2 + 2s + 2).$$
 Sketch the root locus.

- (b) Explain stepper motor in details. List its applications. (4)

7. (a) Draw the Nyquist plot and find the stability of the following open transfer function of unity feedback control system $G(s)H(s) = K(s + 1) / s^2(s + 10)$, (6)

- (b) With the neat diagram explain PID compensation in detail. (4)