

# National Institute of Technology, Delhi

Name of the Examination: B.Tech.

Re-Mid Semester Examination (Autumn- Oct 2023)

Branch : ECE

Semester : III

Title of the Course : Control Theory

Course Code : ECLB 205

Time: 1 Hour 30 Minutes

Maximum Marks: 25

Note: All questions are compulsory.

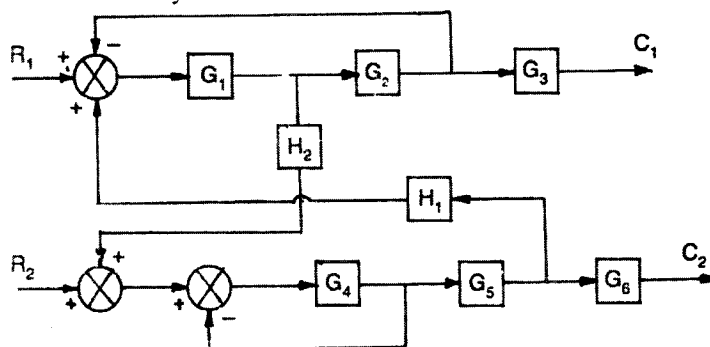
COURSE OUTCOMES		COGNITIVE LEVELS
CO1	To understand the basic concept of control system and identify a set of algebraic equation to represent and model complicated system into more simplified form.	Remembering (Level I)
CO2	Interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.	Understanding (Level II)
CO3	To build different types of controllers and compensator to ascertain the required dynamic response from the system and solve control system related problems.	Applying (Level III)
CO4	To test the stability of the control system using time domain and frequency domain analysis	Evaluating (Level V)

Course Outcomes(CO's)	CO1	CO2	CO3	CO4
Questions No.	Q1, Q2	Q4	Q3	Q5

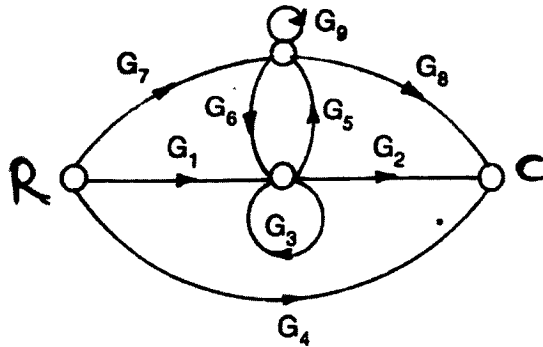
Answer the following questions.

Q1. Draw the root locus of the system whose open loop transfer function of a feedback system is  $G(s)H(s) = [K(s+2)(s+3)]/[(s+1)(s-1)]$  [5 Marks]

Q2. Write the output  $C1/R1$  of the system [5 Marks]



Q3. Calculate the transfer function of the signal flow graph using Manson's Gain formula. [5 Marks]



- Q4. The open loop transfer function of unity feedback system  $G(s) = k/s(sT + 1)$  where  $k$  and  $T$  are the constants having positive values. Calculate, by what factor the amplifier gain be reduced so that (a) the peak overshoot of unit step response of the system is reduced from 75% to 25%. (b) the damping ratio increases from 0.1 to 0.6. [5 Marks]
- Q5. Evaluate the range of  $k$  for stability of the system using RH criteria. [5 Marks]  
 $s^3 + 3ks^2 + (k + 2)s + 4 = 0$