

# National Institute of Technology, Delhi

Name of the Examination: B. Tech

Branch	: ECE	Semester	: III
Title of the Course	: Control System	Course	: ECL 251
		Code	

Time: 3 Hours Maximum Marks: 50

Note:

- Questions are printed on BOTH sides. Answers should be CLEAR, TO THE POINT AND LEGIBLE.
- All parts of a single question must be answered together and in the same sequence as given in question paper. ELSE QUESTION SHALL NOT BE EVALUATED.

## PART A

- Q.1 Why open loop system is more stable than closed loop system? [2]  
 Q.2 Explain Servomechanism. [2]  
 Q.3 Why steady State error? Explain any two steady state error coefficients. [2]  
 Q.4 Given a transfer function

$$G(s) = 200 / (s^2 + 15s + 200)$$

Find TP, %OS, Ts and Tr. [2]

- Q.5 What is the difference between error signal and actuating signal? [2]

## PART B

- Q. 1 Consider mechanical system is shown in fig. 1. Here,  $K_1$ ,  $K_2$  and  $K_3$  are spring constants;  $f_{v1}$ ,  $f_{v2}$  and  $f_{v3}$  are damping coefficients;  $M_1$ ,  $M_2$  are masses; and  $f(t)$  is the applied translational force. Find the electrical PARALLEL analog of the system. [5]

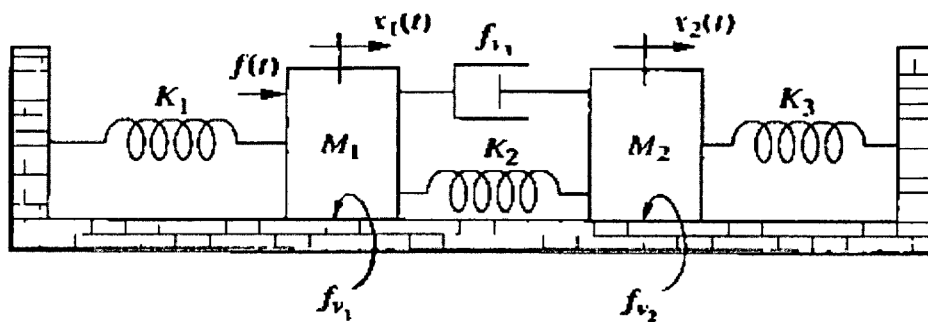


Figure 1

Q. 2 Find the transfer function  $G(s) = V_L(s)/V(s)$  for the network shown in figure below. [5]

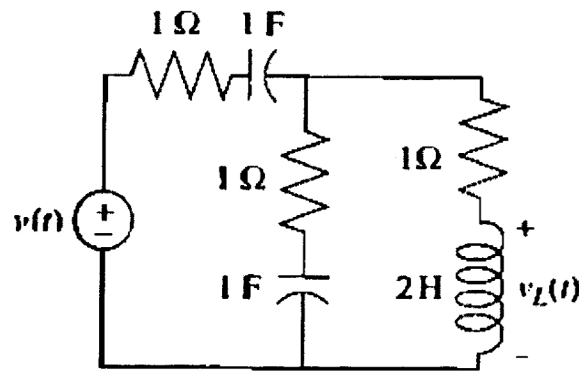


Figure 2

Q.3 A block diagram is shown in fig. 3. Find the transfer function  $C(s)/R(s)$  by block diagram reduction method. [5]

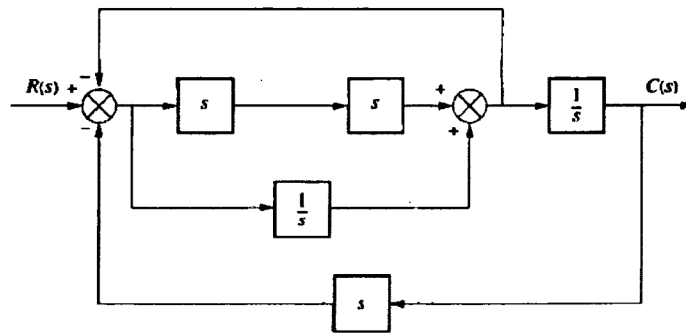
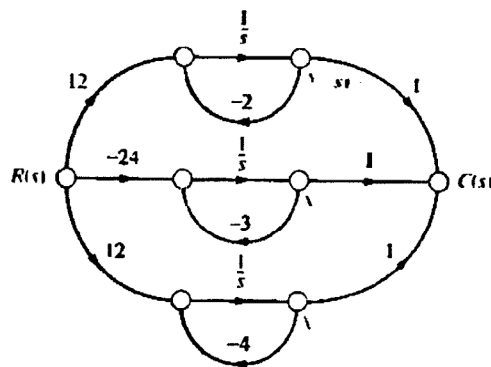


Figure 3

Q.4 A Signal Flow Graph is given in fig. 4. Find the transfer function by utilization of the Mason's Gain Formula. Clearly state all the forward paths and touching /non-touching loops with their path gain. [5]



**PART C**

Q.1 Draw RootLocus plot for the following transfer function: [10]

$$G(s) = \frac{K(s+1)(s+2)}{(s+5)(s+6)}$$

Q. 2 Draw Bode Plot for the following transfer function: [10]

$$G(s) = \frac{K}{(s+5)(s+20)(s+50)}$$