Dr Hitesh Hasnat. (98) 2/12/2021

Roll No.....

National Institute of Technology, Hamirpur (HP)

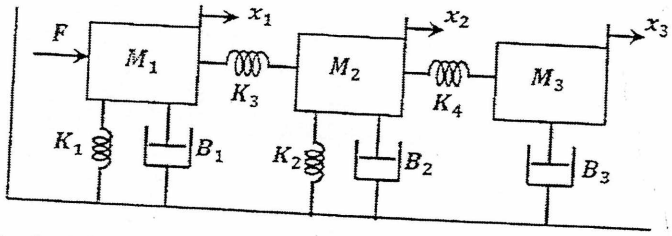
Name of the Examination: B.Tech

Branch	:	ECE	Semester	:	7h
Course Name	:	Control System	Course Code	:	EC-411

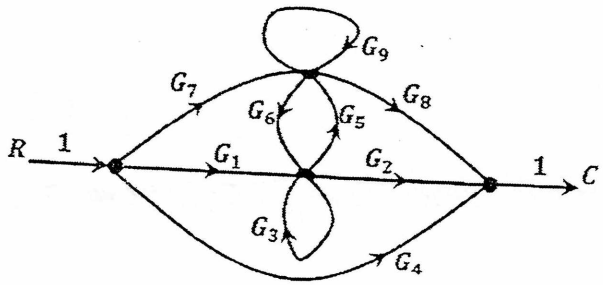
Time: 3 Hours **Maximum Marks: 50**

Note: All questions are compulsory.
Assume data where ever Necessary.

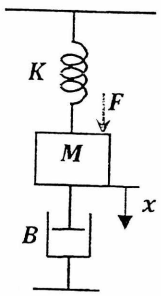
1. Design the analogous electrical circuit for the mechanical system shown using current-force analogy. Write down the differential equations. (6)

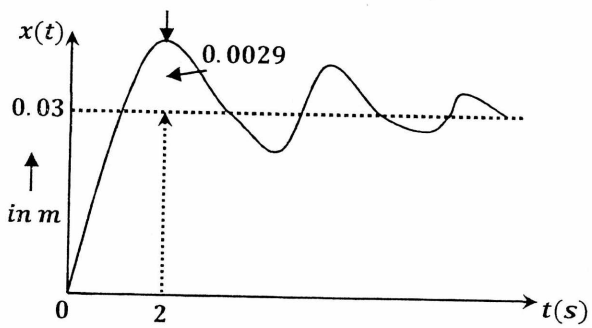


2. Obtain the transfer function using Mason's gain formula by sketching the signal flow graph of the circuit shown. (6)

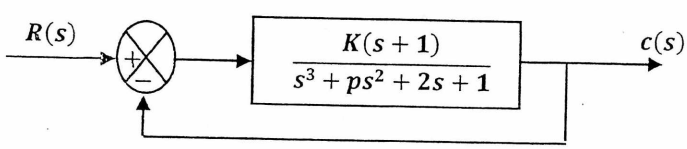


3. Figure shows a mechanical system. When 8.9N force is applied to the system, the mass oscillates as shown in the graph. Determine M, B and K of the system from this response curve. (6)





4. The system shown oscillates with frequency of 2 rad/sec. find the value of K_{mar} and p. No poles are in R. H. S (4)



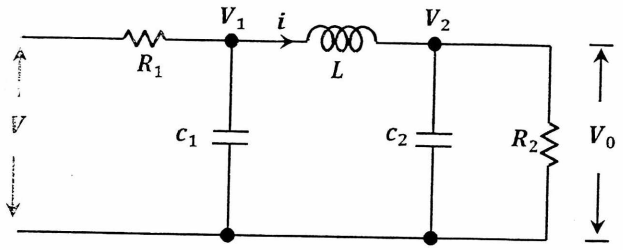
99

5. The open-loop transfer function of a system is $G(s)H(s) = \frac{K(s+4)}{(s+2)(s+3)}$. Draw the complete root locus and comment on the stability of the closed –loop system. (6)

6. For a system $G(s)H(s) = \frac{K}{s^2(s+2)(s+3)}$. Find the value of K to limit the steady state error to 10 when the input to the system is $1 + 10t + \frac{40}{2}t^2$ (4)

7. For the feedback control system, $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$. Sketch the Nyquist plot and find the range of K for the system to be stable. (6)

8. Obtain the state model for the given electrical network in standard form, where $x_1 = v_1, x_2 = v_2$ and $x_3 = i$. (6)



9. The transfer function of a control system is given by $\frac{Y(s)}{U(s)} = \frac{s+2}{s^3+9s^2+26s+24}$. Obtain the state model representation for the system and check for controllability and observability. (6)