Roll No: | | | | | | | | | | | |

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 02:00 PM - 03:30 PM

Course Code: EEE2510 **Course Name:** Control Systems Engineering

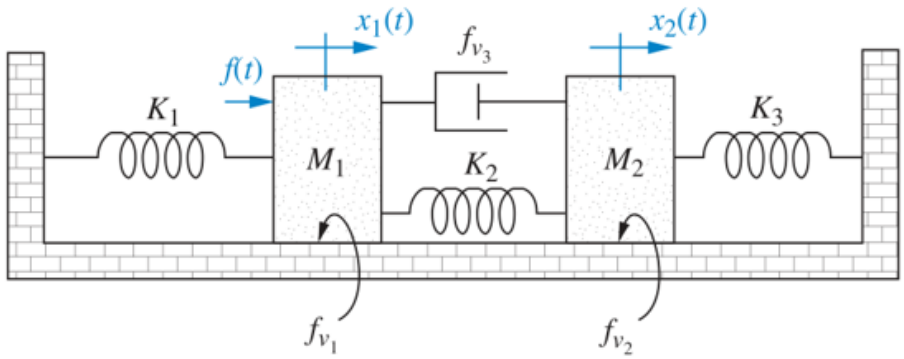
Semester: Fifth Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	24	10	56

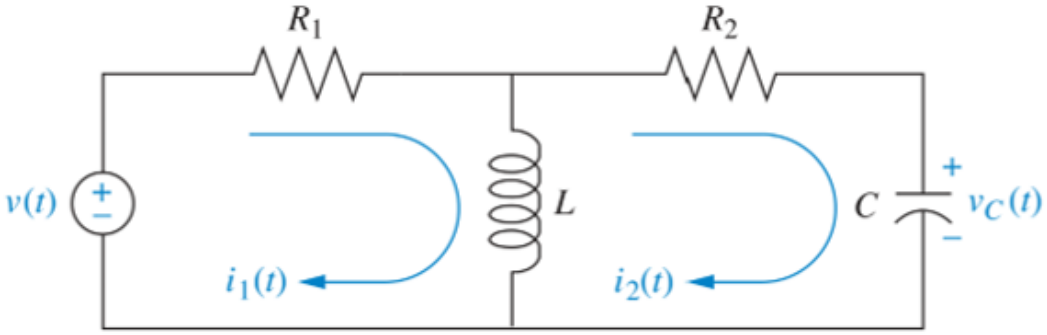
PART A: Answer Following Questions. 10 M

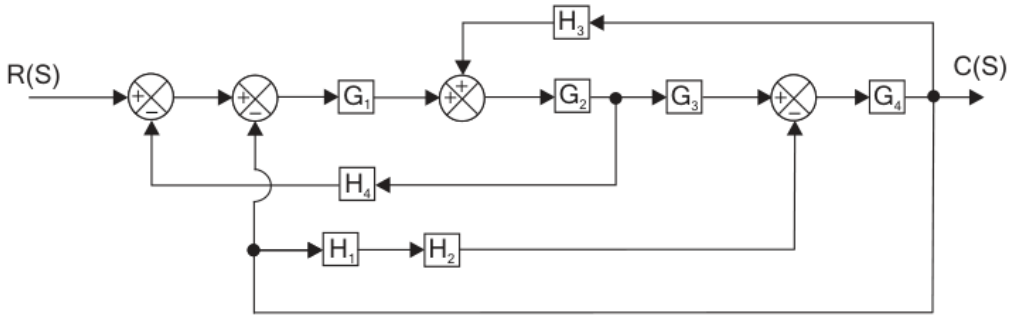
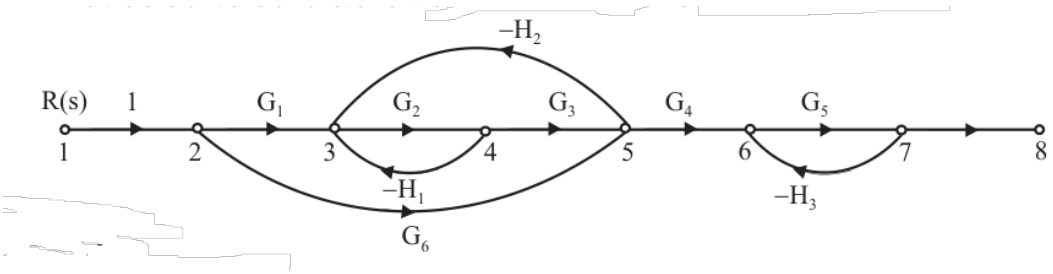
Q.N.	Questions	M	CO	BT
1	Determine whether a flow transducer represented by *Vout=2F+1.5* is linear or nonlinear. Justify your answer.	2	CO1	BT3
2	Classify an automobile suspension system as static or dynamic and explain the reason.	2	CO1	BT3
3	Classify each of the following second-order closed-loop system transfer functions by its damping type and state the nature of its characteristic roots (poles) in the *s* -plane: $T_1(s) = \frac{36}{s^2+7.2s+36}$	2	CO3	BT3
4	A high-speed pick-and-place robot joint is governed by the closed-loop transfer function $T(s) = 100 / (s^2 + 10s + 100)$ Determine the natural frequency (ω_n) and damping ratio (ζ) of the system.	2	CO3	BT2
5	Select the appropriate controller (P, PI, PD, or PID) for eliminating steady-state error in a speed control system and justify your choice.	2	CO3	BT3

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	For the mechanical system shown in the figure, derive the mathematical model and obtain the transfer function $X_2(s)/F(s)$. 	10	CO1	BT3

PTO (Please Turn Over)

7	For the electrical system shown in the figure, derive the mathematical model by applying Kirchhoff's laws. Obtain the governing differential equation and determine the transfer function relating the output voltage ($V_c(s)$) to the input voltage($V(s)$).  	10	CO1	BT3

PART C: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
8	Using block diagram reduction technique find closed loop transfer function of the system whose block diagram is shown in fig.  	10	CO2	BT3
9	Find the overall transfer function of the system corresponding to the signal flow graph shown in the figure by applying Mason's Gain Formula.  	10	CO3	BT3

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	The unity-feedback system is characterized by the open-loop transfer function $G(s) = K / [s(s + 10)]$ Determine the gain K such that the closed-loop system has a damping ratio of 0.7. For this value of K, determine the peak overshoot and the time at peak overshoot for a unit-step input.	10	CO3	BT3
11	A unity-feedback control system is characterized by the open-loop transfer function $G(s) = 10 / [s(s + 2)]$ Analyze the transient response of the closed-loop system and determine the rise time, percentage peak overshoot, peak time, and settling time for a step input of 10 units.	10	CO3	BT3

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**

12	The open-loop transfer function of a servo system with unity feedback is $G(s) = 10 / [s(0.1s + 1)]$ Evaluate the static error constants of the system. Obtain the steady-state error of the system when subjected to the polynomial input $r(t) = a_0 + a_1t + (a_2/2)t^2$	10	CO3	BT3
13	A unity-feedback system has the forward transfer function $G(s) = K_1(2s + 1) / [s(5s + 1)(1 + s)^2]$ When the input is $r(t) = 1 + 6t$, determine the minimum value of K_1 such that the steady-state error is less than 0.1.	10	CO3	BT4