

Code: 20EE3501

**III B.Tech - I Semester – Regular / Supplementary Examinations  
NOVEMBER 2023**

**CONTROL SYSTEMS  
(ELECTRICAL & ELECTRONICS ENGINEERING)**

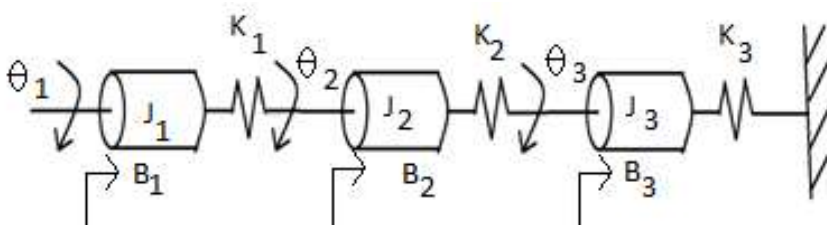
Duration: 3 hours

Max. Marks: 70

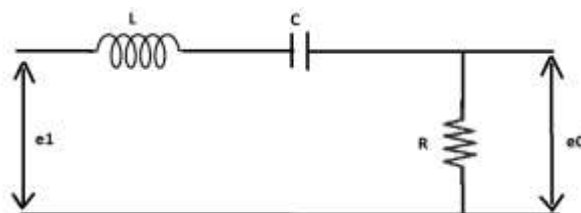
Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.  
2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks
<b>UNIT-I</b>					
1	a)	Write the differential equations governing the system shown in below fig. 	L3	CO2	7 M
	b)	Explain briefly the closed loop control system with an application of air conditioning system.	L3	CO2	7 M
<b>OR</b>					
2	a)	Explain the effect of feedback on i) Sensitivity ii) Gain	L3	CO2	7 M

	b)	Determine the transfer function of the network shown in fig.	L4	CO4	7 M
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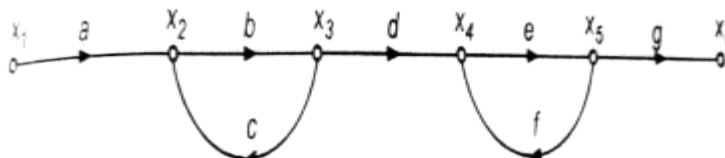


### UNIT-II

3		Deduce the transfer function of armature controlled DC servo motor.	L4	CO4	14 M
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### OR

4	a)	What is Masons gain formula? Discuss the rules for drawing signal flow graphs with an example.	L3	CO2	7 M
	b)	Determine $x_6/x_1$ for the given signal flow graph.	L4	CO4	7 M



### UNIT-III

5	a)	Write a short note on i. Delay time ii. Rise time iii. Peak time iv. Maximum peak overshoot	L3	CO3	4 M
	b)	Derive step response of second order system when $\zeta < 1$ . (under damped system).	L3	CO3	10 M

### OR

6	A unity feedback system has $(s) = K/[s(s+2)(s+5)]$ Sketch root locus and show on it i) Angle of asymptotes ii) Centroid iii) Break away point iv) Root locus intersecting imaginary axis.	L4	CO4	14 M
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**UNIT-IV**

7	Sketch the bode plot for the given transfer function; determine the system gain K for the gain cross-over frequency to be 5 rad/sec. $G(s) = Ks^2 / [(1+0.2s)(1+0.02s)]$	L4	CO4	14 M
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**OR**

8	a)	Explain (i) Gain margin (ii) Phase margin (iii) Gain cross over frequency (iv) Phase cross over frequency with an example.	L3	CO3	7 M
	b)	Write short notes on resonant peak, resonant frequency and bandwidth with formulae?	L3	CO4	7 M

**UNIT-V**

9	a)	Obtain the state variable representation of an armature controlled DC motor.	L3	CO2	10 M
	b)	Write a short notes on (i) state variable                      (ii) state (iii) state vector                      (iv) state space	L3	CO2	4 M

**OR**

10	a)	<p>Consider the system defined by</p> $\dot{x} = Ax + Bu$ $y = Cx$ $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \text{ and } C = [10 \ 5 \ 1]$ <p>Determine the system for complete observability.</p>	L4	CO5	8 M
	b)	List the properties of State transition matrix.	L4	CO5	6 M