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CBCS SCHEME

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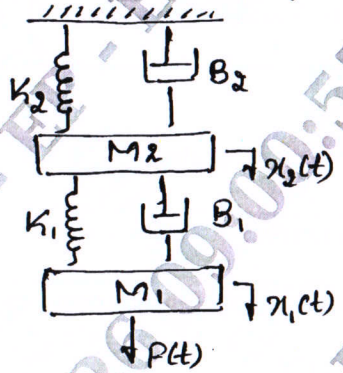
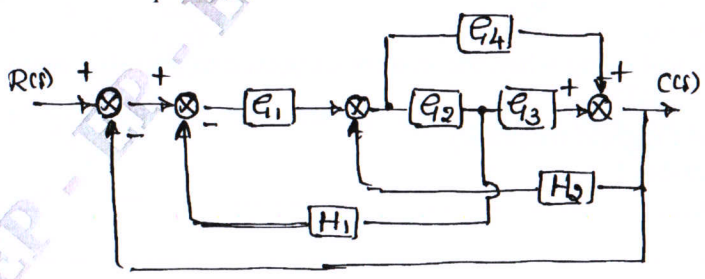
BME703

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026
Control Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain open loop and closed loop control system, with two examples for each.	10	L2	CO1
	b.	What are the requirements of a control system? Briefly explain.	5	L1	CO1
	c.	Draw the block diagram of proportional plus integral controller and explain.	5	L2	CO1
		OR			
Q.2	a.	Determine the transfer function of mechanical system show in Fig.Q2(a).  Fig.Q2(a)	15	L3	CO1
	b.	Explain with block diagram on proportional plus derivative controller.	5	L2	CO1
		Module – 2			
Q.3	a.	Explain with block diagram, series and feedback compensation.	6	L2	CO3
	b.	Reduce the block diagram shown in Fig.Q3(a) to its simplest possible form and find its closed loop transfer function.  Fig.Q3(b)	14	L3	CO3

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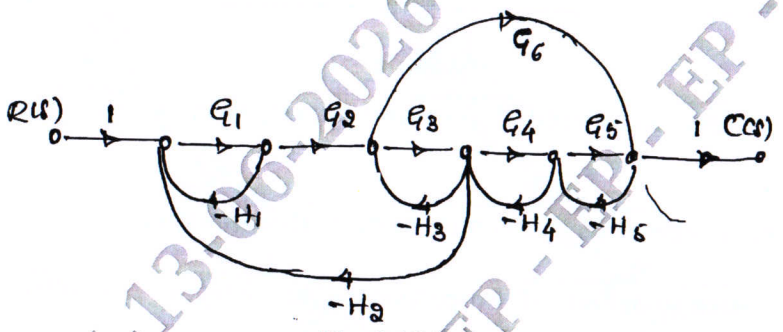
OR

Q.4	**a.**	Explain : i) Lead compensator ii) Lag compensator.	**6**	**L2**	**CO3**
	b.	Find the transfer function by using Mason's gain formula for the signal flow graph shown in the Fig.Q4(b).  Fig.Q4(b)	**14**	**L3**	**CO3**

Module – 3

Q.5	**a.**	Define : i) Delay time ii) Rise time iii) Peak time iv) Maximum overshoot.	**8**	**L1**	**CO2**
	b.	Derive an expression for time response of first order system subjected to i) Step input ii) Ramp input.	**12**	**L3**	**CO2**

OR

Q.6	**a.**	Obtain an expression for time response of the second order mechanical system subjected to unit step input for under damped case. Also show the response curve.	**12**	**L2**	**CO2**
	b.	A unity feedback system is characterised by open loop transfer function : $G(s) = \frac{10}{s^2 + 2s + 6}$ Determine the following when the system subjected to unit step input i) Damping ratio ii) Undamped natural frequency iii) Peak overshoot iv) Peak time.	**8**	**L4**	**CO2**

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Module – 4

Q.7	a.	Analyze the stability of the system given by characteristics equation : $S^6 + 3s^5 + 5s^4 + 9s^3 + 8s^2 + 6s + 4 = 0$ By Routh-Hurwitz criterion.	8	L5	CO4
	b.	Sketch the root locus plot for the system with OLTF. $G(s)H(s) = \frac{K(s+3)}{s(s+1)(s+2)}$.	12	L4	CO4

OR

Q.8		Sketch the root locus plot for the system with OLTF $G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+6)}$ Also find the range of 'K' for which the system is stable.	20	L5	CO4

Module – 5

Q.9	a.	Explain Nyquist stability criteria and list the advantages of Nyquist plot	6	L2	CO4
	b.	Comment on stability of the system using Nyquist stability criterion whose open loop transfer function is given by : $G(s)H(s) = \frac{K}{s(s+2)(s+10)}$.	14	L3	CO4

OR

Q.10		Sketch the Bode plot for the system with $G(s)H(s) = \frac{2}{s(s+1)(1+0.2s)}$ Also obtain gain margin and phase margin and crossover frequencies.	20	L5	CO4

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