U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

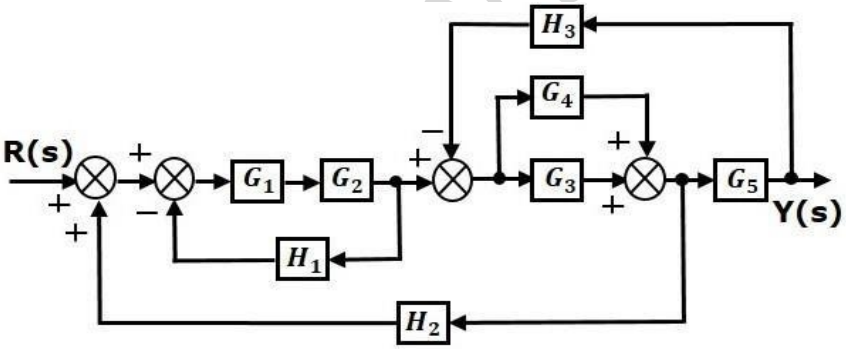
Autonomous Institute Affiliated to VTU

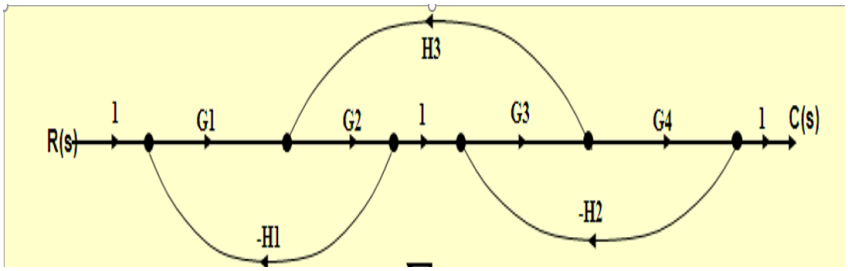
September / October 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Medical Electronics Engineering **Duration: 3 hrs.**
Course Code: 22MD4PCPCS **Max Marks: 100**
Course: PHYSIOLOGICAL CONTROL SYSTEM

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	List the differences between closed loop and open loop control systems.	*CO1*	*PO1*	**4**
	b)	Consider the block diagram shown in the Figure 1. Reduce the block diagram into single block using the block diagram reduction rules.  Figure 1.	*CO1*	*PO1*	**10**
	c)	Elucidate the operation of closed-loop Position control system using servomotor, with the load whose position has to be controlled is connected to motor shaft through gear wheels.	*CO1*	*PO1*	**6**
		OR			
2	a)	List the differences between Engineering and Physiological Control systems.	*CO1*	*PO1*	**5**

		b)	Determine the transfer function for the signal flow graph shown in the Figure 2.  Figure 2.	*CO1*	*PO1*	**8**
		c)	Describe the contribution of interrelated systems to the muscle stretch reflex.	*CO1*	*PO1*	**7**
			UNIT - II			
	3	a)	Plot the response of a second order system for unit-step input with various values of damping ratio and elaborate on time domain specifications.	*CO2*	*PO2*	**10**
		b)	Draw the simplified model of cardiac output regulation and Plot the response of Cardiac output curves for the factors that affects slope and position and only position.	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	Investigate the stability of the systems having the characteristic equation $s^5+4s^4+8s^3+8s^2+7s+4=0$ and comment on the number of roots lying on RHS of S plane with routh stability criterion.	*CO3*	*PO3*	**10**
		b)	Analyze stability of the linearized model of pupillary light reflex using Routh-Hurwitz criterion.	*CO3*	*PO3*	**10**
			UNIT - IV			
	5	a)	Justify how adjustment of Starling resistor or the vertical position of the arterial capacitance allowed the researchers to control arterial pressure.	*CO4*	*PO4*	**10**
		b)	Draw the conclusion from Kao and Ray's experiment on anesthetized dogs to determine whether "the increase in cardiac output observed during exercise was due to neural or humoral factors".	*CO4*	*PO4*	**10**
			UNIT - V			
	6	a)	Define Bode plot and enumerate the advantages of frequency response analysis.	*CO3*	*PO3*	**8**
		b)	For the following transfer function draw bode plot and obtain gain cross-over frequency. $$G(s) = \frac{20}{s(1+3s)(1+4s)}$$	*CO3*	*PO3*	**12**
			OR			

	7	a)	Examine the Bode plots with frequency response of the linearized lung mechanics model in open-loop and closed-loop modes.	*CO3*	*PO3*	**10**
		b)	Illustrate the frequency responses of the circulatory control model under conditions that stimulate normal heart rate control, complete β-adrenergic blockade and complete parasympathetic blockade with suitable diagrams.	*CO3*	*PO3*	**10**

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