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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E.
Branch: Medical Electronics Engineering
Course Code: 22MD4PCPCS
Course: PHYSIOLOGICAL CONTROL SYSTEM

Semester: IV
Duration: 3 hrs.
Max Marks: 100

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

			UNIT - I	CO	PO	Marks
1	a)		Compute C(s)/R(s) using Mason's gain formula for the signal flow graph shown in Fig 1.a Fig.1.a	CO1	PO3	**10**
	b)		Draw the equivalent mechanical system and analogous systems based on F-V and F-I methods for the given system. Fig 1.b	CO1	PO3	**10**
			OR			
2	a)		Obtain C(s)/R(s) of the system shown in Fig 2.a using block diagram reduction techniques. Fig.2.a	CO1	PO3	**10**

		b)	Illustrate the working of muscle stretch reflex with a neat schematic and block diagram.	CO1	PO3	**10**
			UNIT - II			
3		a)	Illustrate the process involved in the regulation of glucose and insulin.	CO2	PO3	**07**
		b)	The unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$ .Determine the gain K ,so that the system will have a damping ratio of 0.5 for this value of K. Determine settling time, peak overshoot and time to peak overshoot for a unit step input.	CO2	PO3	**08**
		c)	Derive the expression for steady state error.	CO2	PO3	**05**
			UNIT - III			
4		a)	Briefly explain the following terms with respect to root locus technique. i)Centroid ii)Asymptote iii)Breakaway point	CO3	PO3	**06**
		b)	For a system with characteristic equation $F(S) = S^6+3S^5+4S^4+6S^3+5S^2+3S+2=0,$ examine the stability of the system	CO3	PO3	**06**
		c)	Elaborate on the stability analysis of the pupillary light reflex with suitable functional diagram and linearized model.	CO3	PO3	**08**
			UNIT - IV			
5		a)	Discuss the basic problems in physiological system analysis.	CO4	PO3	**06**
		b)	Illustrate the process of the Starling heart lung preparation	CO4	PO3	**08**
		c)	Briefly explain the closed loop identification of the respiratory control system.	CO4	PO3	**06**
			UNIT - V			
6		a)	A unity feedback control system has $G(s) = \frac{80}{S(S+2)(S+20)}$.Draw the Bode plot. Determine GM, PM, ω_{gc} and ω_{pc}. Comment on the stability.	CO3	PO3	**14**
		b)	Describe the frequency response of circulatory control system model.	CO3	PO3	**06**
			OR			
7		a)	Discuss the frequency response of glucose –insulin regulation	CO3	PO3	**10**
		b)	Highlight the advantages of frequency response analysis.	CO3	PO3	**06**
		c)	Define the following terms i) Gain Margin ii) Phase margin iii) Gain crossover frequency iv) Phase crossover frequency.	CO3	PO3	**04**

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