Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL/MAY 2026

Fourth Semester

Biomedical Engineering

UBMT24403 - BIO CONTROL SYSTEMS

(Ordinary graph sheet, Semilog Graph sheets and Polar Graph sheets can be Permitted)

Regulations - 2024

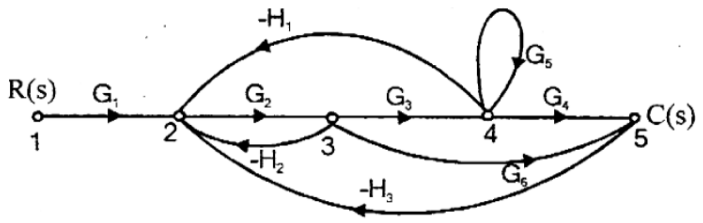
Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BTL*	*CO*	*Marks*
1.	Distinguish between open loop and closed loop system.	L2	1	2
2.	What are the elements of a physiological control system?	L1	1	2
3.	List the various time domain specifications.	L1	2	2
4.	Find the damped frequency of oscillation for a second order system which has a damping ratio of 0.6 and natural frequency of oscillation is 10 rad/sec.	L2	2	2
5.	State Routh's criterion for stability.	L1	3	2
6.	Clarify the main purpose of root locus.	L2	3	2
7.	Define Phase margin and gain margin.	L1	4	2
8.	How do you determine the stability of a system by using Nyquist criterion?	L2	4	2
9.	What happens when a muscle is excited?	L1	5	2
10.	Distinguish between fast and slow twitch muscle fibers.	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Develop a linear model of a physiological system and apply it to analyze system behavior under different input conditions.	L3	1	16
		Or			
	b	Apply Mason's gain formula to determine the transfer function of the given signal flow graph.	L3	1	16



12.	a	Derive the expression for second order system for under damped case and when the input is unit step.	L3	2	16
		Or			
	b	Obtain the expression for Kp, Kv, and Ka for Type 0, 1 and 2 systems when the input is unit step, ramp and parabolic.	L3	2	16

13.	a	Use the Routh stability criterion to determine the location of roots on the s-plane and hence the stability for the system represented by the characteristic equation $s^5+4s^4+8s^3+8s^2+7s+4=0$.	L3	3	16
		Or			
	b	The open loop transfer function of a unity feedback system is given by $G(s) = K(s+9) / s(s^2+4s+11)$. Sketch the root locus of the system. Find Centroid, Angle of asymptotes , break away or break in points.	L3	3	16
14.	a	Calculate the system gain K by sketching the Bode plot for the transfer function $G(s) = Ks^2 / (1+0.2s)(1+0.02s)$ with gain cross over frequency of 5 rad/sec.	L3	4	16
		Or			
	b	An open loop transfer function of a unity feedback system given by $G(s) = 1 / s^2(1+s)(1+2s)$. Sketch the Polar plot and using it determine the gain and phase margin for the system.	L3	4	16
15.	a	Explain in detail the Simple models of muscle stretch reflex action.	L2	5	16
		Or			
	b	Describe the transient response analysis of neuromuscular reflex model.	L2	5	16