Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fourth Semester

Biomedical Engineering

BM3451 - Bio Control Systems

(Provide Ordinary graph sheet and Semi log sheet)

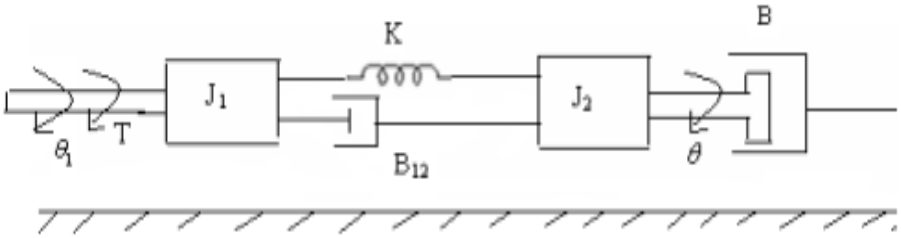
Regulations - 2021

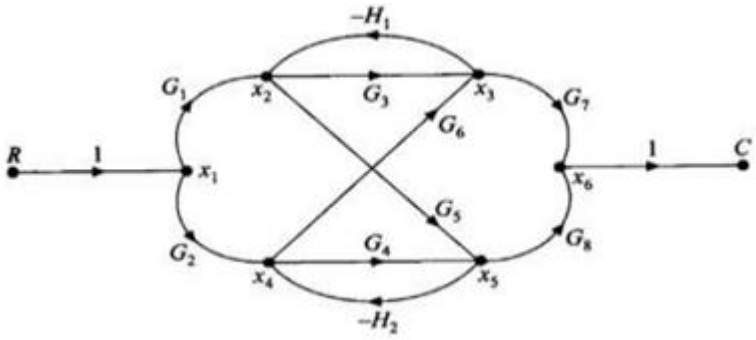
Duration : 3 Hrs ***Maximum : 100 Marks***

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Infer open loop and closed loop systems with examples.	L1	1	2
2.	What is the significance of a block diagram in system modeling?	L2	1	2
3.	Define peak overshoot.	L1	2	2
4.	List the time domain specifications.	L2	2	2
5.	Define root locus.	L1	3	2
6.	Infer centroid. How the centroid is calculated?	L2	3	2
7.	What is phase and gain cross over frequency?	L1	4	2
8.	Write the expression for resonant peak and resonant frequency.	L2	4	2
9.	Explain the role of the muscle spindle in the muscle stretch reflex mechanism.	L1	5	2
10.	What is the significance of steady state analysis in the muscle stretch reflex action?	L2	5	2

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

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Write the differential equations governing the mechanical rotational system shown in the figure and find transfer function. 	L3	1	16
		Or			
	b	Using mason's gain formula find the transfer function $\mathbf{C/R}$ for the signal flow graph shown in figure.	L3	1	16



12.	a	A unity feedback control system has the open loop transfer function is $G(s)=\frac{K}{(s+A)(s+2)}$. Find the values of K and A. So that the damping ratio is 0.707 and the peak time for unit step response is 1.8 sec.	L2	2	16
		Or			
	b	Derive the expression for the response of a second order system to a unit step input.	L2	2	16
13.	a	Determine the range of K for stability of unity feedback system whose open loop transfer function is $\mathbf{G(s)\ H(s)=\frac{K}{S(S+1)(S+2)}}$ using Routh's stability criterion.	L2	3	16
		Or			
	b	Sketch the root locus of the system whose open loop transfer function is $\mathbf{G(s)\ H(s)=\frac{K}{S(S+2)(S+4)}}$.	L2	3	16
14.	a	Sketch the Bode plot for the system having the following transfer function $\mathbf{G(s)=\frac{15(S+5)}{S(S^2+16S+100)}}$.	L3	4	16
		Or			
	b	Draw the Nyquist plot for the system whose open loop transfer function is, $\mathbf{G(s)H(s)=\frac{K}{S(S+2)(S+10)}}$. Determine the range of K for which closed loop system is stable.	L3	4	16
15.	a	Analyze the transient response of the neuromuscular reflex model, explaining its significance in controlling muscle movement.	L4	5	16
		Or			
	b	Evaluate the stability of the pupillary light reflex control system, considering factors such as feedback loops and response times.	L4	5	16