

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Fourth Semester

Biomedical Engineering

BM3451-Bio Control Systems

(Ordinary graph sheet, semi log sheet, polar plot can be permitted)

Regulations - 2021

Duration : 3 Hrs

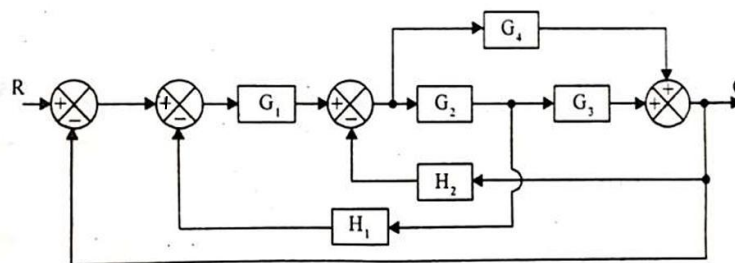
Maximum : 100 Marks

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

Q.No	Questions	BLT	CO	Marks
1.	Write Mason's Gain formula.	L1	1	2
2.	List out the advantages of closed loop control system.	L1	1	2
3.	Sketch the response of a second order under damped system.	L2	2	2
4.	What is type and order of the system?	L1	2	2
5.	How are the roots of the characteristic equation of a system related to stability?	L1	3	2
6.	What do you mean by root locus?	L1	3	2
7.	State gain margin and phase margin.	L1	4	2
8.	Draw the approximate polar plot for a Type 0 second order system.	L2	4	2
9.	Write an example of a physiological system.	L1	5	2
10.	Draw the simple model of eye movement	L2	5	2

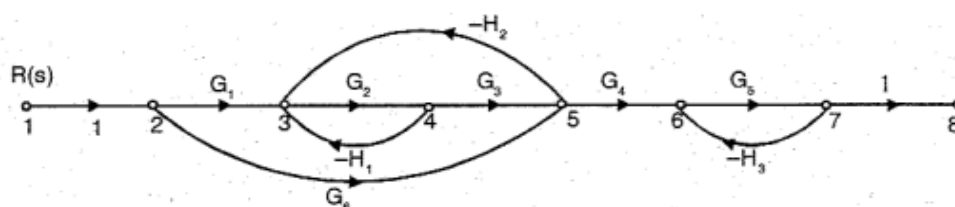
PART - B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11.	a Obtain the closed loop transfer function $C(S)/R(S)$ of the system shown in fig. using block diagram reduction techniques:	L3	1	16



Or

b	Find the overall transfer function of the system whose signal flow graph is shown in fig:	L3	1	16
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12.	a	A unity feedback control system has transfer function $C(s) / R(s) = 16 / (S^2 + 1.6S + 16)$. The damping ratio is 0.8. Find the rise time, percentage overshoot, peak time and settling time.	L3	2	16
		Or			
	b	Derive the expression for a unit step response of second order under damped system.	L3	2	16
13.	a	Sketch the Root locus of the unity feedback system whose open loop transfer function is $G(s) = K / s (s^2 + 6s + 10)$.	L3	3	16
		Or			
	b	Using Routh criterion comment on the stability of the system, whose characteristic equation is i) $s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0$ ii) $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$.	L3	3	16
14.	a	Draw the Bode diagram for the following transfer function and obtain the gain and phase cross over frequencies $G(S) = 10 / s(1 + 0.4s)(1 + 0.1s)$.	L3	4	16
		Or			
	b	Sketch the polar plot for the open loop transfer function of unity feedback system is given by $G(s) = 1 / s^2(1+s)(1+2s)$ and obtain the gain and phase margin.	L3	4	16
15.	a	Illustrate the simple model of muscle stretch reflex action and show its function.	L2	5	16
		Or			
	b	Outline the Circulatory Model with neat sketch and relate the input and output parameters involved in it.	L2	5	16