

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

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

Fourth Semester

Biomedical Engineering

BM3451 – BIO CONTROL SYSTEM

(Provide Ordinary graph sheet and Polar graph sheet)

Regulations - 2021

Duration : 3 Hrs

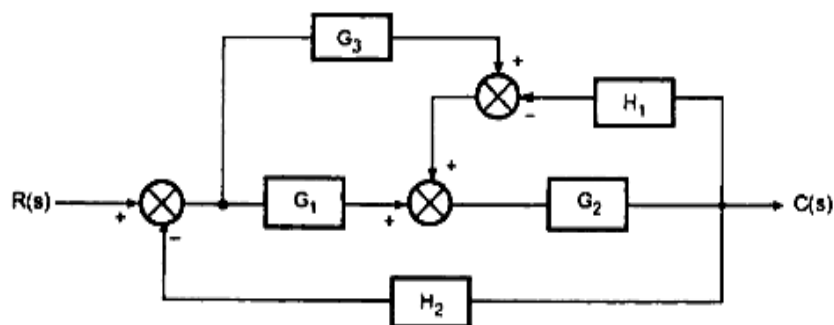
Maximum : 100 Marks

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

Q.No	Questions	BLT	CO	Marks
1.	Why negative feedback is preferred in a closed loop control system?	L1	1	2
2.	Differentiate between a physiological control system and an engineering control system.	L2	1	2
3.	For the given transfer function, find the type and order of the system. $C(S) / R(S) = 10(S+2) / (S^2 + 3S + 5)$	L1	2	2
4.	How the locations of roots of characteristic equation are related to stability?	L2	2	2
5.	What is the main objective of root locus analysis technique?	L1	3	2
6.	Outline necessary and sufficient condition for stability in routh stability criterion.	L2	3	2
7.	Compare Bode plot and Nyquist plot.	L2	4	2
8.	In minimum phase system, how the starting and end point of polar plot are identified.	L1	4	2
9.	Recall the basic mechanism of muscle stretch reflex action.	L1	5	2
10.	Illustrate the concept of frequency response of circulatory control model.	L2	5	2

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

Q.No	Questions	BLT	CO	Marks
11.	a Find the overall transfer function of the system shown by block diagram, using signal flow graph technique.	L3	1	16



Or

b	What are linear models of physiological system and explain with suitable examples.	L2	1	16
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12. a A unity feedback control system has an open loop transfer function $G(s) = 10 / S(S+2)$. Find the rise time, peak time, percentage overshoot and settling time for step input of 12 units.

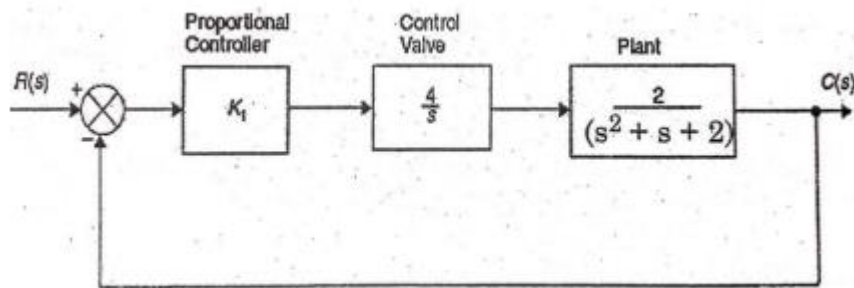
Or

- b For a unity feedback system $G(S) = [200 / \{s(s+8)\}]$ and $r(t) = 2t$ determine the Steady state error. If it is desired to reduce this existing error by 5% find new gain of the system.

13. a Contrast Routh array and determine the location of roots on the s-plane and hence the stability of the system represented by the characteristic equation $S^7 + 5S^6 + 9S^5 + 9S^4 + 4S^3 + 20S^2 + 36S + 36 = 0$.

Or

- b Sketch the root locus of the control system as shown in figure find the value of proportional controller gain k_1 to make system unstable.



14. a The open loop transfer function for a unity feedback system is given by $G(s) = 3 / s(1+s)(1+2s)$ Sketch polar plot and determine the phase margin.

Or

- b Discuss the procedure for constructing the Bode magnitude and phase plot.

15. a With necessary equations explain transient response analysis of neuromuscular reflex model action.

Or

- b Analyze the effect of changing pupil area on total light flux by raising the light intensity and automatic aperture control with the help of necessary diagram.