Reg.No.												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 12007

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – MAY / JUNE 2024
Fifth Semester
Biomedical Engineering
U19BM509 – BIO CONTROL SYSTEMS
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analysing	K6 - Creating

PART – A

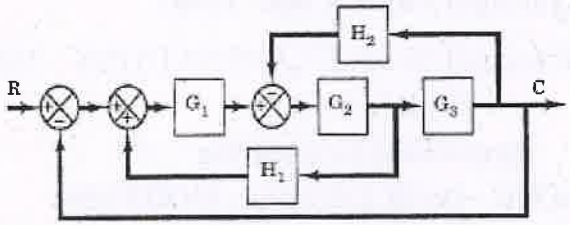
(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define the Mason's gain formula.	2	K1	CO1
2.	Compare the difference between engineering and physiological control system.	2	K2	CO1
3.	How the system is classified depending on the value of damping?	2	K1	CO2
4.	What is the necessary and sufficient conditions for stability?	2	K1	CO2
5.	Define gain margin and phase margin of a control system.	2	K1	CO3
6.	What is nyquist stability criterion?	2	K1	CO3
7.	Sketch the model of endocrine System.	2	K2	CO4
8.	Identify the function of temperature and pressure control system of humans.	2	K3	CO4
9.	Define mean circulatory pressure.	2	K1	CO5
10.	Recall the function of automatic nervous system.	2	K1	CO5

PART – B

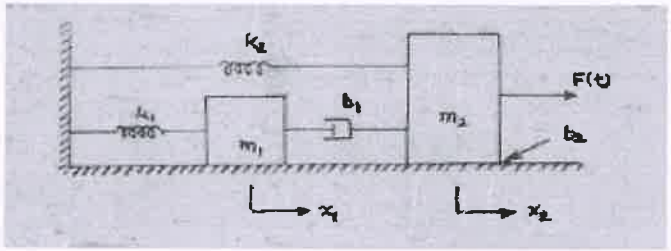
(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	Develop the signal flow graph for the given system block diagram and obtain the closed loop transfer function of the system C(S)/R(S) using mason's gain formula	13	K3	CO1



(OR)

	b)	Construct the differential equations governing the motion of the mechanical translational system shown in figure. Also obtain the transfer function.	13	K3	CO1



12.	a)	A unity feedback control system has an open loop transfer function $G(s) = \frac{10}{s(s+5)}$ Determine its closed loop transfer function, damping ratio and natural frequency of oscillations. Also evaluate the rise time, peak overshoot, peak time and settling time for a step input of 12 units.	13	K3	CO2

(OR)

	b)	i. Using Routh-Hurwitz criterion, determine the stability of a system representing the characteristic equation $S^5+S^4+2S^3+2s^2+3S+5=0$	6	K3	CO2
		ii. A unity feedback control system has an open loop transfer function $G(s) = \frac{K}{S(S2+4S+13)}$. Sketch the rootlocus.	7		
13.	a)	Sketch the bode plot for the following transfer function and determine Gain and Phase crossover frequencies. $G(s)=\frac{10}{S(1+0.4S)(1+0.1s)}$	13	K3	CO3

(OR)

	b)	Draw the Nyquist plot for the system whose open loop transfer is, $G(s) = \frac{K}{S(S+2)(S+10)}$ Determine the range of k for which closed loop system is stable.	13	K3	CO3

14.	a)	With a neat diagram explain about heart model and pulmonary mechanism?	13	K2	CO4
		(OR)			
	b)	Explain the working mechanism of blood glucose control system.	13	K2	CO4
15.	a)	Explain in detail about Pupillary light reflex control system.	13	K2	CO5
		(OR)			
	b)	Explain in detail about the muscle stretch reflex action control system.	13	K2	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Analyze the Cardiovascular control system. With a neat diagram, explain the importance of this system in human being.	15	K4	CO5
		(OR)			
	b)	The openloop transfer function of a unity feedback system is given by $G(S)=\frac{1}{S2(1+S)(1+2S)}$ sketch the polar plot and determine the gain margin and phase margin.	15	K4	CO3