Q.P. Code: 18EE0211 **R18**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations December-2021

CONTROL SYSTEMS

(Common to EEE & ECE)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

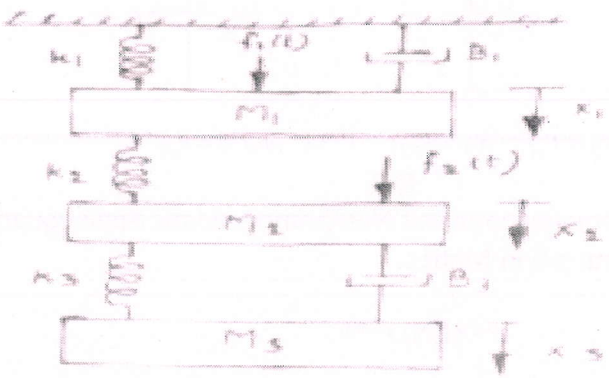
1	**a**	Draw the signal flow graph with a suitable example.	**L3**	**2M**
	b	List the standard test signals.	**L2**	**2M**
	c	What is the concept of stability?	**L1**	**2M**
	d	Compare frequency domain and time domains in linear control systems	**L2**	**2M**
	e	Define the concept of controllability and availability.	**L1**	**2M**

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2		For the mechanical system shown in figure, Draw the Force-Voltage and Force-Current electrical analogous circuits and verify by mesh and node equations.	**L5**	**10M**



OR

3	**a**	Compare open loop and closed loop control systems based on different aspects.	**L3**	**5M**
	b	Distinguish between Block diagram Reduction Technique and Signal Flow Graph.	**L3**	**5M**

UNIT-II

4		For a unity feedback control system the open loop transfer function $G(s) = \frac{10(s+2)}{s^2(S+1)}$	**L5**	**10M**

Find

i. The position, velocity and acceleration error constants.

ii. The steady state error when the input is R(S) where $R(s) = \frac{3}{s} - \frac{2}{s^2} + \frac{1}{3s^3}$

OR

5		Define steady state error. Derive the static error components for Type 0, Type 1 & Type 2 systems.	**L3**	**10M**

UNIT-III

6	**a**	Explain the procedure for constructing root locus with suitable example.	**L2**	**5M**
	b	Determine the range of K for which the system represented by the characteristic equation $S^2 + KS + 2K - 1 = 0$ is stable	**L4**	**5M**

OR

7	a	Using Routh criterion analyse the stability of the system whose characteristics equation is $S^4+8S^3+18S^2+16S+5=0$.	L5	4M
	b	A feedback control system has the following characteristic equation $S^4+3S^3+12S^2+(K-16)S+K=0$. Determine the root-loci for the system and show that the system is conditionally stable.	L5	6M

UNIT-IV

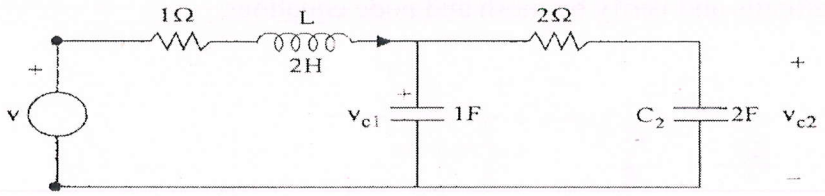
8	a	Obtain the transfer function of Lag Compensator, draw pole-zero plot and write the procedure for design of Lag Compensator using Bode plot.	L3	7M
	b	List the various properties of Nyquist Plots.	L2	3M

OR

9	a	Draw the Nyquist plot for the system whose open loop transfer function is, $G(S)=\frac{K}{S(2+S)(10+S)}$. Determine the range of k for which closed loop system is stable.	L5	8M
	b	Write the expression for resonant peak and resonant frequency	L2	2M

UNIT-V

10		Obtain the state space representation of the electrical system shown in figure:	L5	10M



Take $X_1=I_l$; $X_2=V_{c1}$; $X_3=V_{c2}$; $V=U$ *and* $y=V_{c2}$.

OR

11	a	Determine the Solution for Homogeneous and Non homogeneous State equations	L3	5M
	b	State the properties of State Transition Matrix.	L2	5M

END