Karunya UNIVERSITY
(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. _____

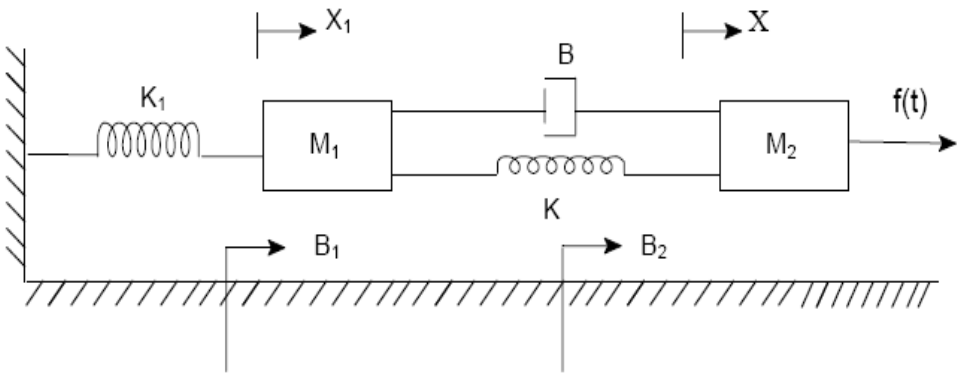
End Semester Examination – Nov/Dec - 2016

Semester : 2016-17 ODD

Code : 11EE219/12EE219/EE259 **Duration : 3 hrs**

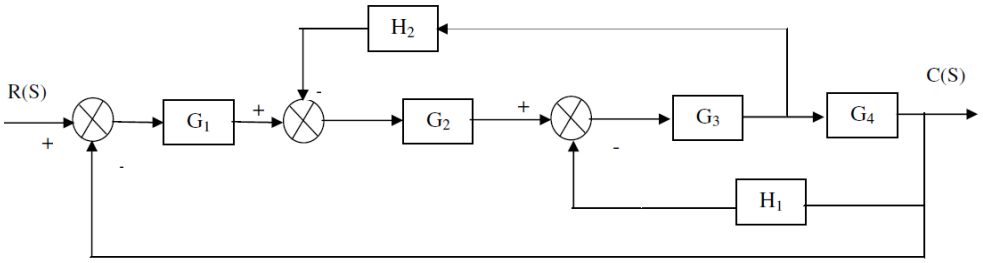
Sub. Name : CONTROL SYSTEMS **Max. marks : 100**

Q. No.	Questions	Marks
	PART-A(10X1=10 MARKS)	
1.	Write force balance equation of spring, mass and damper.	(1)
2.	State and prove the rule of eliminating a feedback loop.	(1)
3.	Define ramp signal.	(1)
4.	If τ=1 then the system is said to be_____.	(1)
5.	What is characteristic equation?	(1)
6.	Name the plots used for open loop systems.	(1)
7.	What is an asymptote?	(1)
8.	What is phase cross-over frequency?	(1)
9.	What is a state model?	(1)
10.	What are phase variables?	(1)
	PART B(5 X 3= 15 MARKS)	
11	Mention the drawbacks of block diagram approach.	(3)
12	How the system is classified depending on the value of damping?	(3)
13	List the stability of the system based on location of roots of the characteristics equation in the s-plane.	(3)
14	What is Nyquist stability criterion?	(3)
15	What are state variables? Define state of a system.	(3)
	PART C(5 X 15= 75 MARKS)	
16.	Determine the transfer function X(S)/F(S) of the system shown in fig (i)	(15)



fig(i)

(OR)

17.	Determine the overall transfer function C(s) / R(s) for the system shown below. 		(15)
18.	Define the time domain specifications of a second order system. Derive expressions for rise time $\mathbf{t_r}$ and peak time $\mathbf{t_p}$ of second order system for under damped case.		(15)
	(OR)		
19.	For a unity feedback control system the open loop transfer function $\boldsymbol{G(s) = \frac{10(s+2)}{s^2(s+1)}}$. Find,		
	a	Position, velocity and acceleration error constants.	(3)
	b	The steady state error when the input is R(S) where $\mathbf{R(s) = \frac{3}{s} - \frac{2}{s^2} + \frac{1}{3s^3}}$	(12)
20.	Sketch the Bode plot for the following transfer function and determine the phase and gain cross over frequencies. $$\boldsymbol{G(s) = \frac{10}{s(1 + 0.4s)(1 + 0.1s)}}$$		(15)
	(OR)		
21.	The open loop transfer function of a unity feedback system is $\boldsymbol{G(s) = \frac{1}{s(1+s)(1+2s)}}$. Sketch the Polar plot and determine the Gain margin and Phase margin.		(15)
22.	Find the range of K for stability of $\mathbf{S^4+2S^3+2S^2+(3+K)S+K = 0}$ **,for k>0.**		(15)
	(OR)		
23.	Sketch the root locus of the system, whose open loop transfer function is $$\boldsymbol{G(s) = \frac{K}{s(s+2)(s+4)}}$$		(15)
24.	The state variable model of the system is given below. Determine the controllability and observability of the system. $$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -24 & -26 & -9 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$ $$y = [2\ 1\ 0]\, X$$		(15)
	(OR)		
25.	Obtain the state model of the system which is given by $\dddot{y} + 8\ddot{y} + 24\dot{y} + 24y = 3u$ using phase variable form		(15)

ALL THE BEST