Q. Code: 838270

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

M.E. / M.TECH. DEGREE EXAMINATIONS, DEC 2019

First Semester

MS18104 – Control systems Design

(Mechatronics)

(Regulation 2018)

Time: Three Hours **Maximum : 100 Marks**

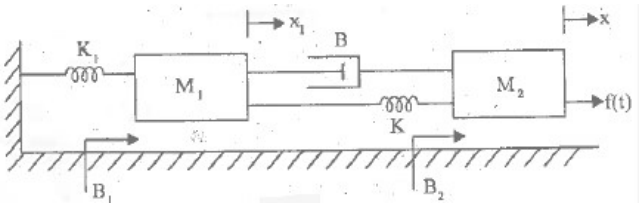
Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	Define transfer function.	1	R
2.	Differentiate an open loop and closed loop system.	1	R
3.	What is meant by tuning of controller?	2	U
4.	Define process variable.	2	R
5.	List four time domain specifications.	3	U
6.	Define phase margin and gain cross over frequency.	3	AP
7.	Mention the characteristics of PI and PID controller.	4	AP
8.	List some of the tuning methods used for tuning PI controller.	4	R
9.	Write some of the features of servo motor.	5	R
10.	What is meant by anti wind-up control of PID controller.	5	R

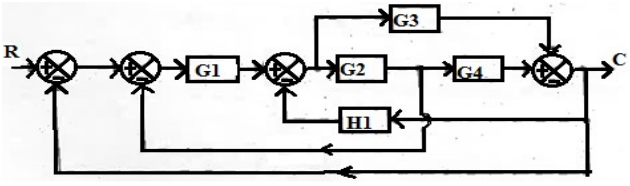
PART B - (5 X16 = 80 Marks)

11.	(a)	Write the differential equations governing the mechanical system shown in fig. and determine the transfer function.	**(16)**	1	AP



(OR)

	(b)	Using the block diagram reduction technique, find the closed loop transfer function of the system whose block diagram is shown in fig.	**(16)**	1	AP



12.	(a)	Describe briefly the characteristics of ON/OFF, P, PI and PID controller.	**(16)**	**2**	**AN**
		(OR)			
	(b)	List the methods used for tuning the controllers and explain any two.	**(16)**	**2**	**AN**
13.	(a)	Sketch the root locus for the unity feedback system whose open loop transfer function is $G(s)=\frac{k(s+2)}{s(s+4)(s+6)}$	**(16)**	**3**	**AP**
		(OR)			
	(b)	Sketch the bode plot for the following transfer function and determine phase margin and gain margin. $G(s)=\frac{k(s+2)}{s(s+4)(s+6)}$	**(16)**	**3**	**AN**
14.	(a)	Explain the procedure for the design of lead compensator using bode plot.	**(16)**	**4**	**AN**
		(OR)			
	(b)	Design a lead compensator for a unity feedback control system with open loop transfer function, $G(s)=\frac{k}{s(s+1)(s+5)}$ to satisfy the following specifications (i) Velocity error constant, $k_v \geq 50$ (ii) Phase margin is $\geq 20°$	**(16)**	**4**	**AN**
15.	(a)	Neatly derive the mathematical expression for servo motor and analyze the servo motor using bode plot.	**(16)**	**5**	**AN**
		(OR)			
	(b)	Briefly explain the anti wind up control of PID controller.	**(16)**	**5**	**AN**