Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

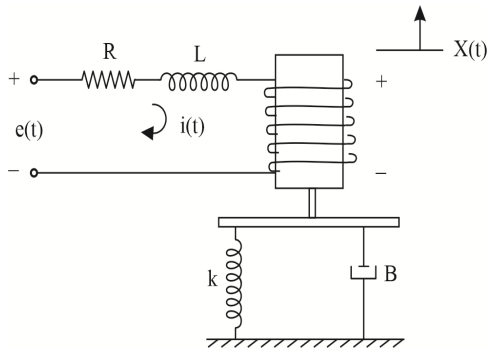
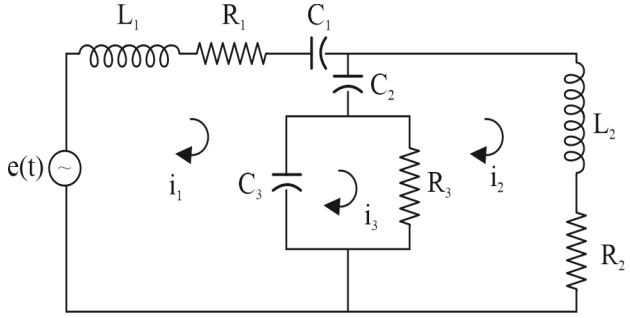
USN | | | | | | | | | | |

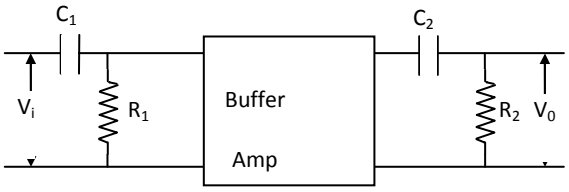
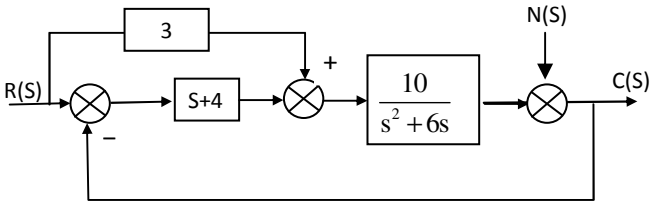
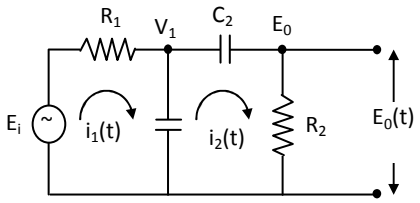
Fourth Semester B.E. Degree Examination

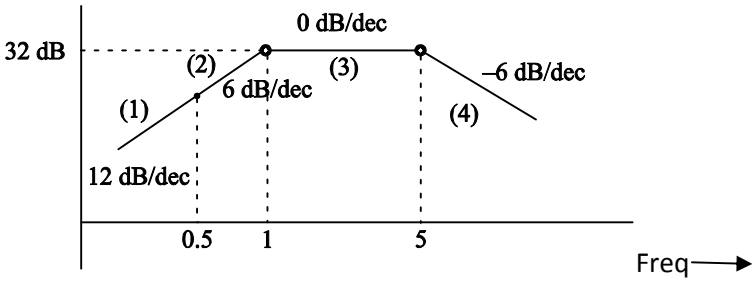
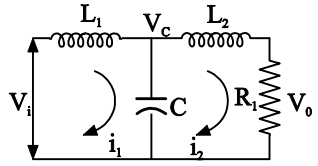
Subject CONTROL SYSTEMS

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02.
03.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	What are the merits and demerits of Closed Loop control systems.	L1 CO1	04 M
	b	Define control system and explain the same with an example.	L1 CO1	04 M
	c	Find the transfer function for the given electro mechanical system shown in Fig 1(c).  $e_b(t) = k_b \frac{dx}{dt}$ k_b back emf constant V m^{-1} s^{-1} FIG 1(C)	L1, L2 CO1	12 M
		OR		
Q.02	a	What are the classification of control system.	L1 CO1	05 M
	b	Explain closed loop control system with an example.	L1 CO1	05 M
	c	Find the Translational mechanical system for the Force Voltage electrical circuit shown in Fig 2 c.  FIG 2 (C)	L1, L2 CO1	10 M

		Module-2		
Q. 03	a	Find the transfer function $\frac{V_0(s)}{V_i(s)}$ for the system shown with unity gain buffer amplifier shown in Fig 3(a)  FIG 3(a)	L1 CO2	06 M
	b	Compare Block diagram and signal flow graph method of finding the transfer function.	L1 CO2	04 M
	c	The system block diagram is given in Fig 3(c) below. Find $\frac{C(s)}{R(s)}$ if N(s) = 0 .  FIG 3 (c)	L1, L2 CO2	10 M
		OR		
Q.04	a	What are the types of Loops and their respective loop gains in a signal flow graph?	L1 CO2	04 M
	b	Find the transfer function by constructing a Block diagram and reducing the same for the circuit shown in Fig 4(b).  Fig 4(b)	L1, L2 CO2	08 M
	c	Find the transfer function by constructing SFG and Mason's Gain formula for the circuit shown in Fig 4 b.	L1,L2 CO2	08 M
		Module-3		
Q. 05	a	Obtain expressions for specifications namely time constant, rise time, and settling time of first order system for a unit step input.	L1 CO3	04 M
	b	Derive an expression for C(t) of an under damped second order system for a unit step input.	L1, L2 CO3	08 M
	c	A unity feedback system is characterized by an open loop transfer function $\mathbf{G(S)} = \frac{\mathbf{K}}{\mathbf{S(S+10)}}$ find the value of K so that the system will have the damping ratio of 0.5. for this value of K find M_P, t_P & t_S for a unit step input.	L1,L2 CO3	08 M
		OR		
Q. 06	a	Starting from the output equation C(t) derive expressions for: (i) Peak time (t_p) (ii) Peak overshoot (M_p) of an under damped second order system subjected to unit step input.	L1, L2 CO3	08 M

	b	A unity feedback system has $\mathbf{G(s) = \frac{K}{s(s+2)(s^2+2s+5)}}$ (i) For a unit ramp input it is desired that $e_{SS} \leq 0.2$. Find K. (ii) Find e_{SS} if $\mathbf{r(t) = 2 + 4t + \frac{t^2}{2}}$	L3 CO3	08 M
	c	Write a short note on PID controllers.	L1 CO3	04 M
		Module-4		
Q. 07	a	Define stability and hence stable, unstable, marginally stable, and conditional stability of a unity feedback system.	L1 CO4	06 M
	b	In a unity feedback system find the range of K for stability and $\mathbf{K_{mar}}$, ω_{mar} with $\boxed{\mathbf{G(s) = \frac{K}{s(1+0.4s)(1+0.25s)}}}$	L1,L2 CO4	06 M
	c	Prove that part of root loci is a circle using angle condition and find the center as well as radius when $\mathbf{G(s)H(s) = \frac{K(s+2)}{s(s+1)}}$	L2, CO4	08 M
		OR		
Q. 08	a	A – ve feedback control system is characterised by $G(s) = \frac{K}{s(s+\alpha)}$ H(s) = 1. Find value of K and α so that $M_r = 1.04$ and $\omega_r = 11.55$ rad/sec	L3 CO5	04 M
	b	Using RH criterion determine the stability of the system, the system is type one system with error constant of 10 sec^{-1} and poles at $\mathbf{S = -3}$ and $\mathbf{S = -6}$	L1 CO4	06M
	c	Find transfer function for the magnitude plot.  	L2,L3 CO5	10 M
		Module-5		
Q. 09	a	Compare transfer function method and state space approach in control systems.	L1,L2 CO5	04 M
	b	Find stability and range of K using Nyquist Plot $G(s)H(s) = \frac{K(s+1)}{s(s-1)}$	L1 CO5	10 M
	c	Write short note on Lead, Lag, lead lag compensators.	L1,CO5	06 M
		OR		
Q. 10	a	Define state, state variable, state space.	L1,CO5	04 M
	b	Obtain the state equations for the electrical network shown in fig 10 b.  FIG 10 (b)	L2, L3 CO5	08 M
	c	A system is given by the following vector matrix equation write $\phi(t)$	L2,L3	08 M

		$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U$	CO5	

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.