Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

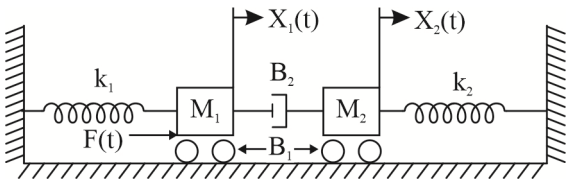
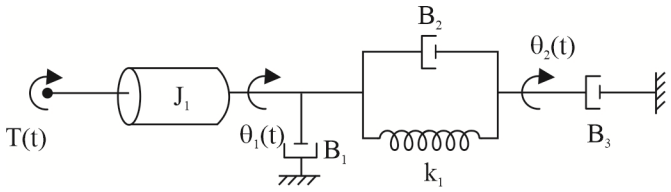
USN | | | | | | | | | | |

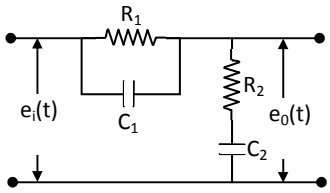
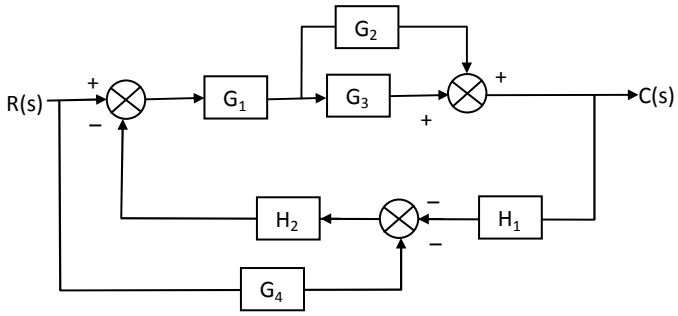
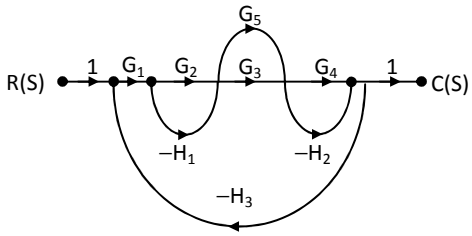
Fourth Semester B.E. Degree Examination

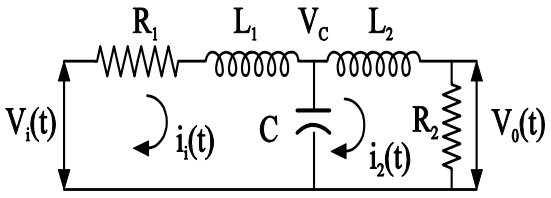
Subject CONTROL SYSTEMS

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	Compare closed loop and open loop control systems. Give one example for each.	L1 CO1	06 M
	b	What are the components of a closed loop control system?	L1 CO1	04 M
	c	Find the Force Voltage analogous electrical network for the given Translational Mechanical system shown in Fig 1(c).  FIG 1(C)	L1, L2 CO1	10 M
		OR		
Q.02	a	What are the effects of negative feedback in control systems?	L1 CO1	05 M
	b	What are the requirements of a good control system?	L1 CO1	05 M
	c	Find the transfer function $\theta_2(s) / T(s)$ and $\theta_1(s) / T(s)$ for the Rotational Mechanical system shown in Fig 2 c.  FIG 2 (C)	L1, L2 CO1	10 M

		Module-2		
Q. 03	a	Derive the transfer Function for the lead lag network shown in Fig 3 a. when R_1=R_2=1 M Ω, C_1 = C_2 = 1 μF.  FIG 3 (a)	L1 CO2	06 M
	b	Write any four rules of reducing Block diagram.	L1 CO2	04 M
	c	Find the transfer function by reducing the block diagram shown in fig 3(c).  FIG 3 (c)	L1, L2 CO2	10 M
		OR		
Q.04	a	Define Mason's gain formula in Signal flow Graph.	L1 CO2	04 M
	b	Find Transfer function by block diagram reduction for the signal flow graph shown in Fig 4 b.  FIG 4 (b)	L1, L2 CO2	08 M
	c	Find the transfer function by Mason's Gain formula for the Signal flow Graph shown in Fig 4 b.	L1,L2 CO2	08 M
		Module-3		
Q. 05	a	List the standard test inputs used in control system with their Laplace transform.	L1 CO3	04 M
	b	Derive the step input response of a first order system.	L1, L2 CO3	08 M
	c	A unity negative feedback control system with $G(s) = \frac{100}{s^2(s+4)(s+12)}$ (i) What is the type of the system? (ii) Find static error coefficients. (iii) Find steady state error if the input is **$r(t) = 2t^2 + 5t + 10$.**	L1,L2 CO3	08 M
		OR		

Q. 06	a	Starting from the output equation C(t) derive expressions for: (i) Rise time (t_r) (ii) Peak overshoot (M_p) of an under damped second order system subjected to unit step input.	L1, L2 CO3	08 M
	b	For servomechanism system $\mathbf{G(s)=\frac{K_1}{s^2}}$ **and** $\mathbf{H(s)=1+K_2 s.}$ Determine the value of K_1, K_2 so that peak overshoot is 0.25 and peak time is 2 seconds for a unit step input.	L3 CO3	08 M
	c	With a neat block diagram explain PI and PD controllers.	L1 CO3	04 M
		Module-4		
Q. 07	a	Explain Routh – Hurwitz criterion for stability of the system and what are its limitations.	L1 CO4	04 M
	b	Find the range of K so that system with characteristic equation as: $S^4 + 22\,S^3 + 10\,S^2 + S + K = 0$ is stable. Also find frequency of oscillation at marginal value of K.	L1,L2 CO4	06 M
	c	Plot root locus for $s^3 + 6s^2 + 8s + K = 0$	L2, CO4	10 M
		OR		
Q. 08	a	For a closed loop control system, $G(s)=\frac{100}{s(s+8)}$ $H(s)=1$, determine resonant peak and resonant frequency.	L3 CO4	04 M
	b	State any three rules of plotting root locus.	L1 CO4	06M
	c	Sketch the Bode plot for open loop transfer function. $G(s)H(s)=\frac{K}{s(1+0.2s)(1+0.05s)}$ Determine the value of K for gain margin (GM) of 6 dB.	L2,L3 CO5	10 M
		Module-5		
Q. 09	a	State mapping theorem and explain Nyquist stability criterion.	L1 CO5	04 M
	b	Draw polar plot for $G(s)H(s)=\frac{10}{s(s+1)(s+2)}$ Find GM and PM, also comment on stability.	L1 CO5	10 M
	c	Explain lead lag compensating networks.	L1,CO5	06 M
		OR		
Q. 10	a	What are the advantages of State Space analysis?	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	Compute the STM for the system given system matrix $\mathbf{A}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ using Laplace approach technique.	L2,L3 CO5	08 M

*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.