CODE No.: 16BT50201 SVEC-16

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

III B.Tech I Semester (SVEC-16) Regular/Supplementary Examinations February - 2021

CONTROL SYSTEMS

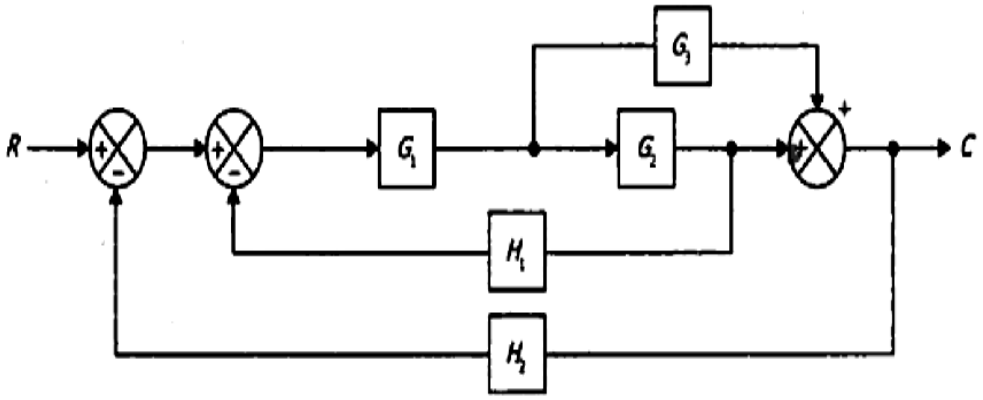
[Electrical and Electronics Engineering, Electronics and Communication Engineering]

Time: 3 hours **Max. Marks: 70**

Answer One Question from each Unit.
All questions carry equal marks

UNIT-I

1	a)	Describe Masson's gain formulae. List out the advantages and disadvantages of signal flow graph.	CO1	6 Marks
	b)	Determine the transfer function of the system using block diagram reduction rules.	CO4	8 Marks



(OR)

2	a)	Briefly describe the effect of feedback on parameters like gain, sensitivity and stability.	CO1	7 Marks
	b)	Derive the transfer function of armature controlled DC motor and draw the block diagram.	CO4	7 Marks

UNIT-II

3	a)	Derive the expression for time response of second order under damped system for unit step input and also draw the response curve.	CO2	6 Marks
	b)	The open loop transfer function of a unity feedback system is $G(s) = \frac{10}{s(s+4)}$. Determine the nature of response of the closed loop system for a unit step input. Also determine the rise time, peak time, peak overshoot and settling time.	CO4	8 Marks

(OR)

4	a)	Sketch the complete root locus for a system with an open loop transfer function $G(s)H(s) = \frac{K}{S^2+2S+2}$.	CO4	10 Marks
	b)	Briefly explain the difficulties in Routh-Hurwitz criterion and how to overcome.	CO1	4 Marks

UNIT-III

5	a)	Derive the expressions for Resonant peak ,Resonant frequency and Bandwidth in frequency domain analysis	CO1	6 Marks
	b)	Sketch the Nyquist plot and determine the stability of the closed loop system, whose open loop transfer function is given by $G(s)H(s) = \frac{K}{S(S^2+2S+6)}$.	CO5	8 Marks

(OR)

6		Draw the Bode plot for the transfer function $G(s) = \frac{16(1+0.5S)}{S^2(1+0.125S)(1+0.1S)}$. From graph determine: i) Gain cross over frequency. ii) Phase cross over frequency. iii) Gain Margin and Phase Margin. iv) Stability of the system.	CO5	14 Marks

UNIT-IV

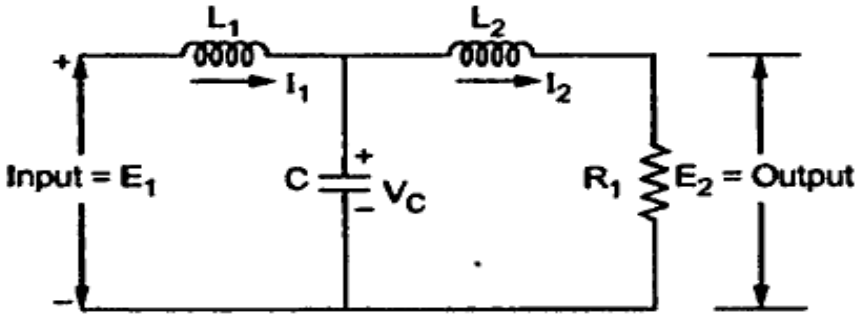
7	a)	What is compensator? Explain the design procedure for a lead compensator.	CO1	7 Marks
	b)	Derive the transfer function of PI controller and also explain how it affects steady state error in second order under damped system when subjected to unit ramp input.	CO6	7 Marks

(OR)

8		The open loop transfer function of a unity feedback system is $G(s) = \frac{K}{s^2(1+0.2s)}$. Design suitable compensator to meet the following specifications. i) Acceleration error constant K_a=10 ii) Phase Margin =30^0.	CO3	14 Marks

UNIT-V

9	a)	Differentiate the state variable approach with transfer function approach for modeling of control systems.	CO2	7 Marks
	b)	Obtain the state model of a given electrical system.	CO2	7 Marks



(OR)

10	a)	What is state transition matrix? Give the properties of state transition matrix.	CO1	7 Marks
	b)	Determine the complete controllability and complete observability of the system with $\dot{X} = AX + BU, Y = CX$. Where $A = \begin{bmatrix} 0 & 1 \\ -1 & -3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, C = \begin{bmatrix} 1 & 1 \end{bmatrix}$	CO4	7 Marks