Entry No: | | | | | | | | | | |

Course Code: ECL DC 208

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

B. Tech. Major Examination, 2024-25

CONTROL SYSTEMS

(Electronics and Communication Engineering)

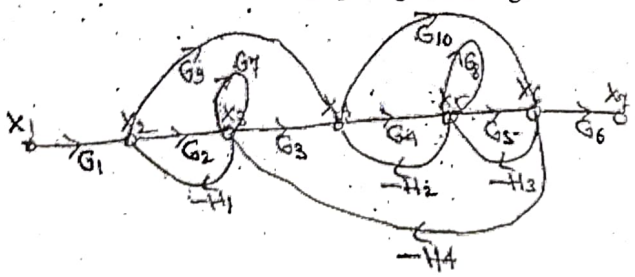
Time: 3 hours **Max. Marks: 40**

1. Answer all 8 questions from Section-A. Each question carries 1 mark.
2. Answer one question from each unit in Section-B. Each question carries 4 marks.

SECTION –A **8 X 1 =08**

1	a	Define transfer function.	L1	CO1	[1M]
	b	What are the standard test signals?	L2	CO2	[1M]
	c	What do mean by type and order of the system?	L2	CO2	[1M]
	d	Differentiate between transient response and steady state response of a system.	L1	CO2	[1M]
	e	Define gain cross over frequency & Phase margin.	L1	CO3	[1M]
	f	What is compensator?	L2	CO4	[1M]
	g	Enlist the properties of state transition matrix.	L2	CO4	[1M]
	h	What is region of convergence (ROC)?	L2	CO5	[1M]

SECTION –B **8 X 4 =32**

UNIT-I					
2	(a)	What are the two major types of control systems? Explain them in detail with practical examples.	L2	CO1	[4M]
		OR			
	(b)	Using Mason's gain formula, find the closed loop transfer function of the system whose signal flow graph is given in Fig.1  Fig. 1	L3	CO1	[4M]
UNIT-II					
3	(a)	The open loop transfer function of a unity feedback system is $G(S) = \frac{25}{S(S+5)}$. Find i) Natural frequency of oscillation ii) Damped frequency of oscillation iii) Damping ratio iv) Maximum over shoot of unit step input.	L3	CO2	[4M]
		OR			
	(b)	The open loop transfer function of a unity feedback system is $G(S) = \frac{10}{S(0.1S+1)}$. Obtain the steady state error of the system, when subject to an input $r(t) = a_0 + a_1 t + \frac{a_2}{2} t^2$	L3	CO2	[4M]

UNIT-III					
4	(a)	Define stability? State the necessary and sufficient condition of Routh Hurwitz criterion and explain the limitations of Routh's stability criterion?	L2	CO2	[4M]
		OR			
	(b)	Construct the Routh array and determine the stability of the system whose characteristics equation is $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$.	L4	CO2	[4M]
UNIT-IV					
5	(a)	Elaborate the step wise procedure for plotting the root locus of a given open loop transfer function.	L2	CO2	[4M]
		OR			
	(b)	Sketch the root locus for the open loop transfer function of a unity feedback control system given below $\boldsymbol{G(S) = \frac{K}{S(S+1)(S+3)}}$	L3	CO2	[4M]
UNIT-V					
6	(a)	The forward path transfer function of a unity feedback control system is $\boldsymbol{G(S) = \frac{100}{S(S+6.45)}}$. Find the resonant peak, resonant frequency, and bandwidth of the closed loop system.	L3	CO3	[4M]
		OR			
	(b)	Explain the procedure for constructing the Bode plot for the given transfer function and also explain how to obtain the Gain margin and Phase margin from the Bode plot.	L2	CO3	[4M]
UNIT-VI					
7	(a)	What is lag compensator? What are the characteristics of lag compensation?	L2	CO4	[4M]
		OR			
	(b)	What is lead compensator? What are the characteristics of lead compensation?	L2	CO4	[4M]
UNIT-VII					
8	(a)	Construct the state model of a system characterized by the differential equation $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = u$. And also give the block diagram representation of the state model.	L3	CO4	[4M]
		OR			
	(b)	A linear time invariant system is characterized by the state variable model. Examine the controllability and observability of the system $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, C = [1 \quad 0]$	L4	CO4	[4M]
UNIT-VIII					
9	(a)	Draw the general block diagram of a digital control system and explain.	L2	CO5	[4M]
		OR			
	(b)	By using Jury stability criterion, determine the stability of the system whose characteristics equation is $Z^4 - 1.2Z^3 + 0.07Z^2 + 0.3Z - 0.08 = 0$.	L4	CO5	[4M]