Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Make Up Examinations – December 2025

Date: 26 – 12- 2025 **Time:** 1.00pm to 04.00pm

School: SOE	**Program:** B.Tech -EEE	
Course Code : EEE3052	**Course Name:** Control Systems for Robotic Applications	
Semester: MK	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	34	33	19	14	-

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	List any two differences between open loop and closed loop control systems.	**2 Marks**	**L1**	**CO1**
2.	Define transfer function, poles and zeros.	**2 Marks**	**L1**	**CO1**
3.	Define stability of a linear system	**2 Marks**	**L1**	**CO2**
4.	For analyzing and designing control systems, we must have a basis of comparison for time response of various control systems. This is accomplished by subjecting the systems to be compared with the typical test signals and recording the time responses. List the commonly used test signals (any two) with their mathematical representation and Laplace transform	**2 Marks**	**L1**	**CO2**
5.	The transient response of a practical control system exhibits damped oscillations before attaining the steady state. Define the following performance indices that are used to characterize the step response to a second order system. Define the terms **maximum overshoot and settling time of a system**	**2 Marks**	**L1**	**CO2**

6.	Stability is the most desired property in designing of control systems. Describe the terms absolute stability and relative stability	**2 Marks**	**L1**	**CO2**
7.	Recall the state model of a linear time invariant system	**2 Marks**	**L1**	**CO3**
8.	What is the expression to convert the state model into Transfer function	**2 Marks**	**L1**	**CO3**
9.	Draw the block diagram representation of a PI controller	**2 Marks**	**L1**	**CO4**
10.	List the difference between state feedback and output feedback	**2 Marks**	**L1**	**CO4**

Part B

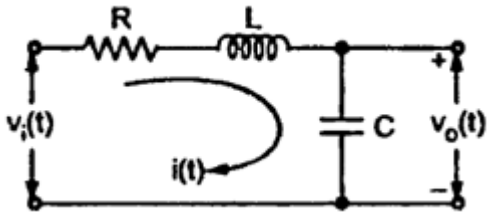
Answer the Questions. **Total Marks 80M**

11.	**a.**	An automobile shock absorber can be represented with single mass, damper and spring with an external force F acting on mass which produces a displacement of x. Identify the various forces acting on the system and determine its transfer function	**10 Marks**	**L3**	**CO1**
		Or			
12.	**a.**	Control theory strongly relies on mathematical models of dynamical systems. Depending on how a dynamical system is modelled, an appropriate control strategy must be selected. Most of the electrical systems can be modelled by three basic elements: Resistor, inductor, and capacitor. Consider a circuit in which these elements are connected in series and determine its transfer function**.**	**10 Marks**	**L3**	**CO1**

13.	**a.**	The robot arms used in industrial manufacturing require control of the position of the end piece. The simplified block diagram model of the system is shown below and has parameters $\zeta = 0.6$ and $\omega_n = 5$rad / sec. The system is subjected to a unit step input, Solve for all the possible time response specification and comment on its performance.	**10 Marks**	**L3**	**CO2**
		Or			
14.	**a.**	For the open loop system whose transfer function is given below 1. Identify the type and order. 2. Find the location of poles and zeros 3. Determine the static error constants for step, ramp and parabolic (acceleration) inputs 4. Determine the steady state errors for step, ramp and parabolic (acceleration) inputs when applied separately.	**10 Marks**	**L3**	**CO2**

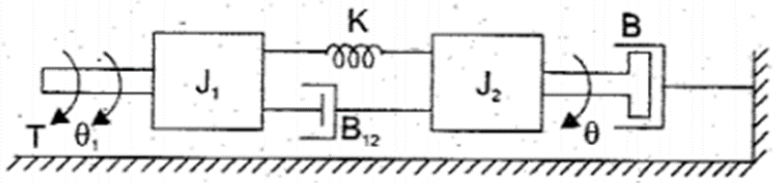
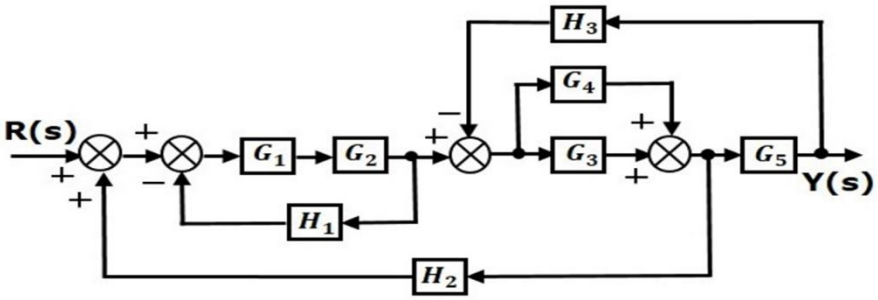
		$G(s) = \frac{5(s^2+2s+100)}{s^2(s+5)(s^2+3s+10)}$			

15.	**a.**	Explain the stability of nonlinear systems	**10 Marks**	**L2**	**CO4**
		Or			
16.	**a.**	Explain the terms state feedback control and integral control	**10 Marks**	**L2**	**CO4**

17.	**a.**	Explain the terms controllability and observability of a linear system and the method to determine the same	**15 Marks**	**L3**	**CO3**
		Or			
18.	**a.**	Compute the state model of the electric circuit given below.  	**15 Marks**	**L3**	**CO3**

19.	**a.**	Determine ζ; ω_n; t_s; t_p; t_r, and *%Overshoot* for a system whose transfer function is $G(s) = \frac{361}{s^2 + 16s + 361}$.	**15 Marks**	**L3**	**CO2**
		Or			
20.	**a.**	For the open loop system whose transfer function is given below 1. Identify the type and order. 2. Find the location of poles and zeros 3. Determine the static error constants for step, ramp and parabolic (acceleration) inputs 4. Determine the steady state errors for step, ramp and parabolic (acceleration) inputs when applied separately $G(s) = \frac{K(s+5)}{s^3(7s^2+12s+5)}$	**15 Marks**	**L3**	**CO 2**

21.	**a.**	Determine the transfer function of the mechanical translational system given below	**20 Marks**	**L3**	**CO1**

					
Or					
22.	**a.**	Using Block diagram reduction techniques, reduce the block diagram given below and determine the transfer function 	**20 Marks**	**L3**	**CO1**