Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B.Tech-EEE	
Course Code: EEE2007	**Course Name:** Control Systems Engineering	
Semester: V	**Max Marks**:50	**Weightage**:25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**26**	**24**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

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

Part A

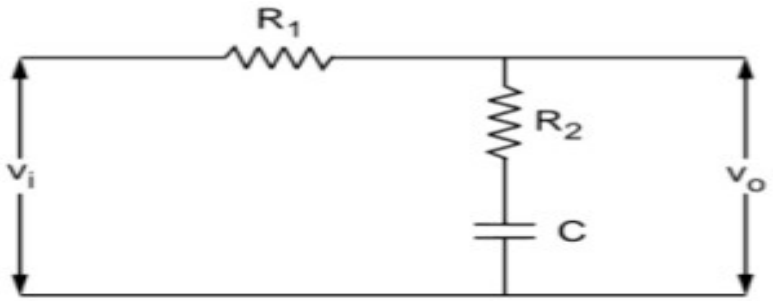
Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	Define the transfer function of a linear time invariant system.	**2 Marks**	**L1**	**CO1**
2	List the block diagram reduction rules for the cases given below. 1. Shifting a summing point after the block 2. Shifting a summing point before the block	**2 Marks**	**L1**	**CO1**
3	The Mason's Gain Formula (MGF) determines the transfer function of a linear system which is represented as signal flow graph. Recall the MGF.	**2 Marks**	**L1**	**CO1**
4	The performance characteristics of a control system are specified in terms of the transient response to unit step input. 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. (a) Rise time (b) Maximum Overshoot	**2 Marks**	**L1**	**CO2**

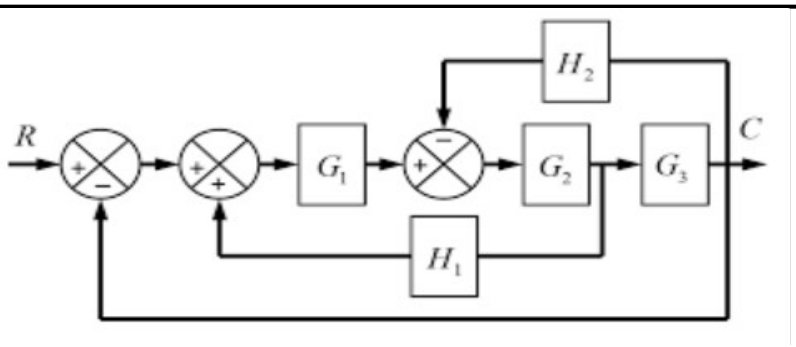
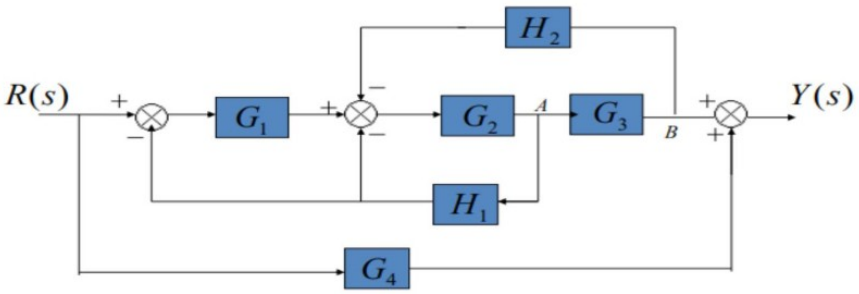
5	For analyzing and designing control systems, we must have a basis of comparison for time response of various control systems. This is accomplished by subjecting the systems to be compared with the typical test signals and recording the time responses. List the commonly used test signals with their mathematical representation and Laplace transform	**2 Marks**	**L1**	**CO2**

Part B

Answer the Questions. **Total Marks 40M**

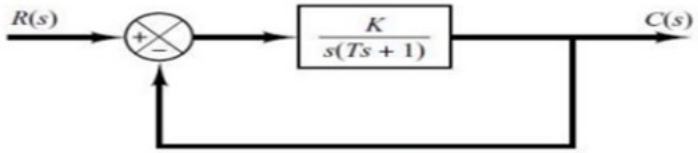
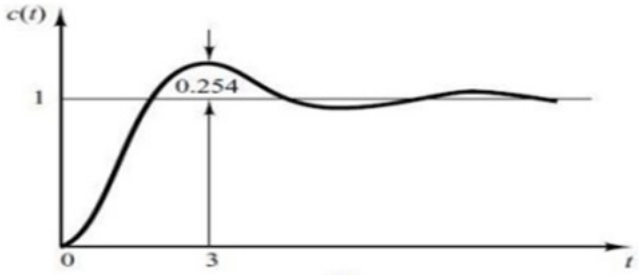
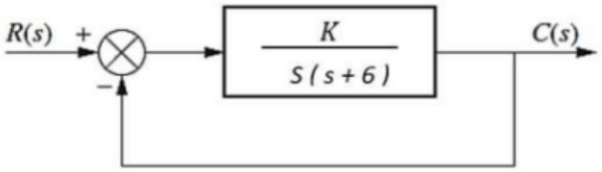
6.	**a.**	Develop the transfer function Vo(s) / Vi(s) of the electrical system shown in the fig.  	**10 Marks**	**L3**	**CO 1**
		Or			
7.	**a.**	An automobile shock absorber can be represented with single mass, damper and spring with an external force F acting on mass which produces a displacement of x. Identify the various forces acting on the system and develop its transfer function	**5 Marks**	**L2**	**CO 1**
	b.	With a sample signal flow graph, explain the following terms 1. Forward Path 2. Non touching loops 3. Forward path gain 4. Transmittance 5. Branch	**5 Marks**	**L2**	**CO 1**

8.	**a.**	Apply the Block diagram reduction techniques to reduce the block diagram given below and obtain the transfer function	**10 Marks**	**L3**	**CO 1**

					
		Or			
9.	**a.**	Draw the Signal Flow Graph and find the overall gain of the following block diagram 	**10 Marks**	**L3**	**CO 1**

10.	**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, Estimate all the possible time response specification and comment on its performance	**10 Marks**	**L3**	**CO2**
		Or			
11.	**a.**	Solve for ζ; ω_n; t_s; t_p; t_r, and %Overshoot for a system whose transfer function is $$G(s) = \frac{16}{s^2 + 1.6s + 16}$$	**10 Marks**	**L3**	**CO2**

12.	**a.**	When the system shown in figure (a) is subjected to a unit-step input, the system output responds as shown in figure (b). Identify the values of K and T from the response curve.	**10 Marks**	**L3**	**CO 2**

		 (a)  (b)			
		Or			
13.	**a.**	Select the value of K for the feedback system given below, so that the system will respond with a 10% overshoot. 	**10 Marks**	**L3**	**CO 2**