R14 Regulation *Subject code:3P4EE0*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, April 2025

CONTROL SYSTEMS

(EEE)

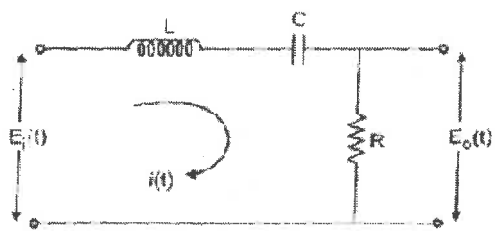
Maximum Marks: 70 Date: 01.05.2025 Duration: 3 hours

Notes: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a_1 to a_4 as sub questions.

Part-A

	All the following questions carry equal marks (10X2M=20 Marks)	Marks	CO	BTL
1	Write the advantages and disadvantages of A.C servo motor and D.C servo motor	2M	1	L1
2	Distinguish between open loop and closed loop systems	2M	1	L1
3	List the standard test inputs and define them and choose the most suitable	2M	2	L1
4	Define delay time and rise time, delay time and peak time	2M	2	L1
5	What is Routh stability ?	2M	3	L1
6	What is root locus?	2M	3	L1
7	What is the difference between polar plot and Nyquist plot	2M	4	L1
8	Write the formulae for the transfer function of lag and lead compensators draw them in s plane	2M	4	L1
9	List the advantages of state space representation?	2M	5	L1
10	Define controllability and observability and write the formulae by using Kalman's test	2M	5	L1

Part-B

	Answer All the following questions. (5X10M=50Marks)	Marks	CO	BTL
11	a) Discuss the characteristics of feedback in control system b) Define the impulse response of the system. Also find the impulse response of the system with open loop transfer function $G(S) = \frac{10}{S\,S+3}$	5M 5M	1	L2
	OR			
12	a) Evaluate the transfer function of the network given figure	5M		
			1	L2
		5M		

	b) Explain translator and rotational elements of mechanical systems.	5M		
13	a) Derive the time response of a second order system for unit step input for underdamped system. b) Derive the steady state error and also derive the various static error constants	5M 5M	2	L2
	OR			
14	a) Explain the conventional P,PI,PD,PID controllers in s domain only b) Derive the steady state error with in s domain only	5M 5M	2	L2
15	Develop the Root locus for $G(s)H(s) = \frac{s}{s(s+5)(s+7)}$ Also find range of 'K' for system to be stable	10M	3	L2
	OR			
16	a) Define the i) stability ii) instability iii) conditional stability iv) marginally stability of system b) use the Routh stability criterion to determine the location of roots on the s-plane and hence the stability for the system represented by the characteristic equation H s)=s6+s5+3s4+3s3+3s2+2s+1=0	5M 5M	2	L2
17	a) Draw the electrical equivalent circuit of lead compensator and obtain its transfer function b) Explain the gain margin, phase margin in polar plot and write the advantages of the same in order to stable in polar plot	5M 5M	4	L2
	OR			
18	a) Derive maximum lead angle ϕm and α of a lead compensator b) Compare polar plot and Nyquist plot	5M 5M	4	L2
19	a) Reduce the given state model into its canonical forms by diagonalizing matrix A, $A = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix}$ $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ and $c = [1 \quad 0 \quad 0]$ b) Determine the state space representation of the $Y(s)/U(s) = \frac{y(5)}{U(s)} = \frac{1}{s^3+4s+13}$	5M 5M	5	L2
	OR			
20	a) Explain the components in a state space representation b) Write the advantages and dis advantages of state space representation	5M 5M	5	L2