R20 Regulation *Subject code: 3P4BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

CONTROL SYSTEMS
(EEE)

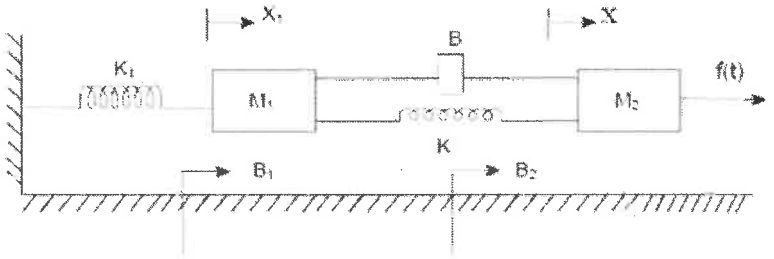
Maximum Marks: 70 Date: 23.12.2025 Duration: 3 hours

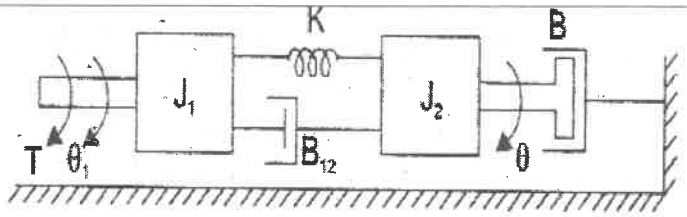
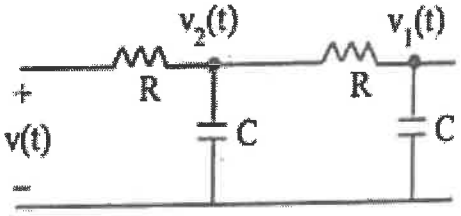
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define open loop system.	2M	1	L1
2	What are the basic properties of signal flow graph?	2M	1	L1
3	What are the standard test signals used in control systems?	2M	2	L1
4	Write about type and order of the system.	2M	2	L1
5	Define absolute and Relative stability.	2M	3	L1
6	What are the limitations of Routh-Hurwitz's stability?	2M	3	L1
7	State Nyquist stability Criterion.	2M	4	L1
8	Define phase crossover frequency.	2M	4	L1
9	What are the properties of state transition matrix?	2M	5	L1
10	What is state diagram?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Write the differential equations governing the Mechanical system shown and determine the transfer function. 	10M	1	L2
	OR			
12	Write the differential equations governing the mechanical rotational system shown below.	10M	1	L2

				
13	Explain about the time domain specifications i)Rise Time ii)delay time iii)peak time iv)settling time v) peak overshoot	10M	2	L2
	OR			
14	Find the steady state errors for the unit step, unit ramp and unit parabolic inputs for the system whose transfer function is $G(S) = \frac{1000(S+1)}{(S+10)(S+50)}$	10M	2	L2
15	With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations: $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0.$	10M	3	L2
	OR			
16	Sketch the root locus of the system whose open loop transfer function is G(s) H(s) =$[\mathbf{K}(\boldsymbol{S}+\mathbf{2})]$ /$[\boldsymbol{S}(\boldsymbol{S}+\mathbf{2})(\boldsymbol{S}+\mathbf{4})]$	10M	3	L2
17	By Nyquist stability determine the stability of the closed loop system whose open loop transfer function is given by $G(S)H(S)=(1+S)^2/S^3$	10M	4	L2
	OR			
18	Explain the procedure to design the Lag Lead Compensator using Bode plot.	10M	4	L2
19	Obtain state model of the electrical network for below figure by choosing $v_1(t)$ and $v_2(t)$ as state variables. 	10M	5	L2
	OR			
20	Construct a state model for a system characterized by the differential equation. $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y + u = 0.$ Give the block diagram representation of the state model.	10M	5	L2