



R20 Regulation **Subject code:3P5DB**
TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
 (Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Supplementary Examinations, December 2024

CONTROL SYSTEMS
(ECE)

Maximum Marks: 70

Date:06.01.2025

Duration: 3 hours

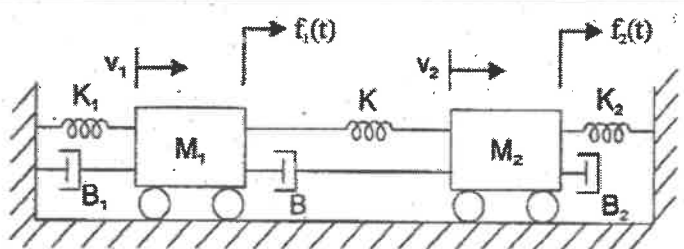
Note: 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20) Marks)		CO	Bloom Tx
1	What are advantages and disadvantages of closed loop systems?	1	L1
2	Write the rule for moving the summing point ahead of a block.	1	L1
3	What are static error constants.	2	L1
4	What is type number of systems? What is its significance?	2	L1
5	What are the limitations of Routh's stability?	3	L1
6	Define gain margin?	3	L1
7	Draw the pole-zero plot of Lag-Lead compensator.	4	L1
8	What is Nyquist stability criterion?	4	L1
9	Define Controlability.	5	L1
10	What are the properties of state transition matrix?	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	A)Determine the transfer function for the block diagram shown in below Figure. [5M] B) Distinguish between Open loop control system and closed loop control system. [5M]	1	L2
OR			
12	Write the differential equations governing the mechanical system shown in figure and also draw the force-voltage and force-current analogous circuits.	1	L2

			
	[10M]		
13	A) For a unity feedback system given by $G(s) = \frac{20(s+2)}{s(s+3)(s+4)}$. Find the steady state error for $r(t) = 3u(t) + 5tu(t)$. [5M] B) Explain about standard test signals. [5M]	2	L2
	OR		
14	What are the time domain specifications? Explain and write the expression for each of them. [10M]	2	L2
15	The characteristic equation of a system is given below [10M] $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0.$ Find whether the system is stable or not using RH Criterion.	3	L2
	OR		
16	A) Write the rules for construction of root locus. [5M] B) Find the root locus for the following characteristic equation [5M] $G(s)H(s) = \frac{K}{s(s^2 + 4s + 13)}.$	3	L2
17	A system has $G(s)H(s) = \frac{k}{s(1+s)(1+0.1s)(1+0.01s)}$. Determine the value of K so that i).GM=10dB ii).PM=25°. Using polar plot. [10M]	4	L2
	OR		
18	Derive the expression for the transfer function of a lag-lead compensator. [10M]	4	L2
19	Given $X(t) = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}$. Find [10M] A) Transfer function of the system B) State transition matrix.	5	L2
	OR		
20	A) What is observability? Explain the tests for observability. [4M] B) Check whether the system represented by [6M] $X(t) = \begin{bmatrix} 0 & 3 \\ -1 & -4 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$ and $y = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}$ is observable or not.	5	L2