



R20 Regulation

Subject code: 3P4BD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024

Control Systems

(EEE)

Maximum Marks: 70

Date: 23.02.2024 Duration: 3 hours

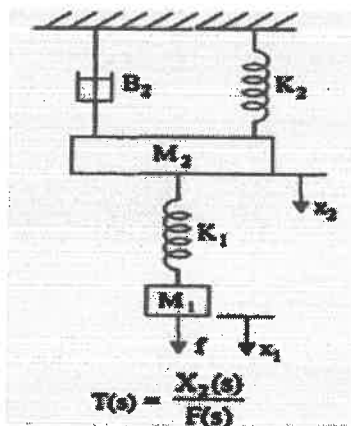
- Note: 1. This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)		CO	Bloom Tx
1	How feedback effects overall gain of the system	CO1	L2
2	What are the different types of control system?	CO1	L2
3	What are the standard test signals used in control systems?	CO2	L3
4	Define steady state response and steady state error	CO2	L2
5	Define a stable system	CO3	L1
6	What are the limitations of Routh's stability	CO3	L2
7	Define resonant frequency.	CO4	L2
8	List different types of plots used for stability analysis	CO4	L2
9	What is meant by state in control system?	CO5	L2
10	What is state variable?	CO5	L2

Part-B

Answer All the following questions. (5X10M=50Marks)

11	A. Obtain the transfer function for the following mechanical translational system fig. [6M]  $T(s) = \frac{X_2(s)}{F(s)}$ Fig. B. Distinguish between Open loop control system and closed loop control system. [4M]	CO1	L3
	OR		L2

12	A. Derive the transfer function and develop the block diagram of Armature controlled DC servo motor. [6M] B. List the properties of signal flow graphs. [4M]	CO1	L3
13	A. Explain the effect of Proportional control action on the performance of a second order system. [5M] B. Obtain the unit step response of a unity feedback system whose open loop transfer function $G(S) = 4/S(S+5)$ [5M]	CO2	L3
	OR		
14	Define transient response specifications. i) Delay time ii) Rise time iii) Peak time iii) Peak overshoot iv) Settling time of second order system [10M]	CO2	L2
15	A. Check the stability of a system with characteristics equation $S^4 + S^3 + 20S^2 + 9S + 100 = 0$ using Routh Hurwitz criterion. [5M] B. Write the various construction rules to develop the root locus. [5M]	CO3	L3
	OR		
16	Sketch the root locus plot of a unit feedback system with the open loop transfer function $G(S) = K/S(S+2)(S+4)$. [10M]	CO3	L4
17	Given the open loop transfer function of a unity feedback system $G(s) = \frac{1}{s(s+3)(1+2s)}$ Draw the Bode plot and measure from the plot the frequency at which the magnitude is 0 dB. [10M]	CO4	L3
	OR		
18	A. Explain the design procedure of lag compensator. [5M] B. Explain how Polar plot is used to fine out the stability of the system. [5M]	CO4	L2
19	A. Define controllability and observability. [5M] B. Compute the state transition matrix [5M] $\begin{bmatrix} 0 \\ x_1 \\ 0 \\ x_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$	CO5	L1 L3
	OR		
20	Construct the state model for a system characterized by the differential equation $\ddot{y} + 6\dot{y} + 11y + 6y = u$. Give the block diagram representation of the state model. [10M]	CO5	L4