



Regulation R17

Subject code: 1P4DC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024**Control Systems**

(ECE)

Maximum Marks: 70

Date: 21.02.2024 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	Define closed loop system.	CO1	L1
2	Define the signal flow graph.	CO1	L1
3	Define the impulse signal	CO2	L1
4	Define the damping ratio.	CO2	L1
5	List the frequency domain specifications.	CO3	L1
6	What is root locus?	CO3	L1
7	Write the need of compensation?	CO4	L1
8	What is the polar plot	CO4	L1
9	Write properties of state transition matrix	CO5	L1
10	What is meant by phase variables	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	Explain the ac servomotor and derive the transfer function. [10M]	CO1	L2
OR			
12	Explain the mechanical translational system components. [10M]	CO1	L2
13	Find the steady state errors for the unit step, unit ramp and unit parabolic inputs for the system whose transfer function. [10M]	CO2	L3
$G(S) = \frac{100(S+1)}{(S+5)(S+20)}$			
OR			
14	The open loop transfer function of a unity feedback system is $G(S) = \frac{8}{S(S+6)}$ i) Determine the nature of response the closed loop system for unit step input Also determine ii) delay time iii) rise time iv) peak time v) setting time vi) peak overshoot. [10M]	CO2	L2

15	Comment on system stability if the characteristic equation of closed loop system is $S^4+6S^3+12S^2+4S+5=0$. [10M]	CO3	L2
	OR		
16	Draw the bode plot for the following function $G(S)H(S)=\frac{5(1+2s)}{(1+4s)(1+0.25s)}$ [10M]	CO3	L3
17	The open loop transfer function of a unity feedback systems is given by $G(S)=\frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot and determine the gain margin and phase margin. [10M]	CO4	L3
	OR		
18	Draw the Nyquist plot for the system whose open loop transfer function is $G(S)H(S)=\frac{K}{s(4+s)(6+s)}$. Determine the range of K for which closed loop system is stable. [10M]	CO4	L3
19	Determine the eigen values of the following matrix. [10M] $A = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix}$	CO5	L2
	OR		
20	Check the controllability and observability of the system whose state space representations are given as: [10M] $\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 1 & -2 & 0 \\ 2 & 1 & -3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 10 \\ 1 \\ 0 \end{bmatrix} u$ $y = [1 \ 0 \ 0] \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} u$	CO5	L3