Regulation R18 *Subject code: 2P4BD & 2P4DB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, February 2024

Control Systems

(Common to EEE & ECE)

Maximum Marks: 70 Date:19.02.2024 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 control system	CO1	L1
2	What is signal flow graph & write masons gain formulae?	CO1	L1
3	Define unit step signal.	CO2	L1
4	What are The damping ratio and natural frequency for the characteristic equation $S^2+4s+13=0$	CO2	L1
5	List the frequency domain specifications	CO3	L2
6	What is root locus and list the steps involved in root locus sketch	CO3	L2
7	What is compensation	CO4	L1
8	What is the polar plot	CO4	L1
9	Write properties of state transition matrix	CO5	L2
10	What is meant by phase variables	CO5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	A. Differentiate between Open loop and closed loop transfer function.[5M] B. What is feedback and write the properties of feedback. [5M]	CO1	L3
	OR		
12	Explain the mechanical translational and rotational system components. [10M]	CO1	L2
13	A. Derive the time response of second order system with unit step input for the under damped system. [5M] B. Find the steady state errors for the unit step, unit ramp and unit parabolic inputs for the system whose transfer function. [5M] $$G(S) = \frac{1000(S+1)}{(S+10)(S+50)}$$	CO2	L3
	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	L3
15	A, Comment on system stability if the characteristic equation of closed loop system is $S^4+8S^3+18S^2+16S+5=0$. [3M] B. Sketch the root locus for A unity feedback control system has an open loop transfer function $G(S)=\frac{k}{s[s^2+4s+13]}$ [7M]	CO3	L3
	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	Draw the electrical equivalent circuit of lag compensator and obtain its transfer function. [10M]	CO4	L3
	OR		
18	Draw the Nyquist plot for the system whose open loop transfer function is $G(S)H(S)=\frac{K}{s(2+s)(10+s)}$. Determine the range of K for which closed loop system is stable. [10M]	CO4	L3
19	A. Define the term state variable. What are the advantages of state space representation? [5M] B. Determine the eigen values of the following matrix. [5M] $A=\begin{bmatrix}0 & 1 & -1\\ -6 & -11 & 6\\ -6 & -11 & 5\end{bmatrix}$	CO5	L3
	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