R18 Regulation Subject code: 2P4BD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, September 2023

Control Systems

(EEE)

Maximum Marks: 70 Date:15.09.2023 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)

1 Define control system.
2 Distinguish between open loop and closed loop systems.
3 Define transient and steady state responses and shows them in graph.
4 Define setting time, peak over shoot and steady state error?
5 List the frequency domain specifications
6 Define root locus and bode plots
7 What is use of type number and order of a system in case of drawing of polar plot ?
8 Define polar plot and Nyquist plot
9 Write the advantages of state space representation
10 What is meant by phase variables

Part-B

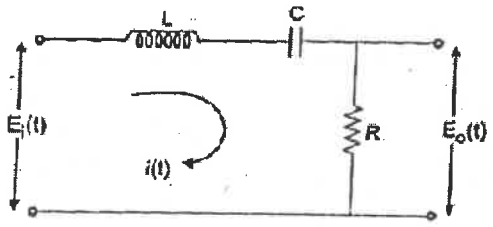
Answer All the following questions. (5X10M=50Marks)

11 a. Write the classifications of control systems and define them and also shows the suitable examples. (5M)

b. Explain all the block diagram reduction rules and prove them and also write the properties of signal flow graph representation. (5M)

OR

12 a. Evaluate the transfer function of the network given figure (5M)



b. Explain translatory and rotary elements of mechanical systems. (5M)

13 a. Define time domain specifications and also Derive the time response of a second order system for unit step input for underdamped system. (5M)

b. Derive the steady state error and also derive the various static error constants. (5M)

OR

14 a. Obtain the response of unity feedback system whose open loop transfer function is (5M)
$G(s) = \frac{k}{S(s+5)}$ *and when the input is unit step input*

b. Write short notes on effect of PI controller and PD controller (5M)

15 a. Comment on system stability if the characteristic equation of closed loop system is
$S^4+8S^3+18S^2+16S+5=0$. (5M)

b. Sketch the root locus for A unity feedback control system has an open loop transfer function
$G(S) = \frac{k}{s[s^2+4s+13]}$ (5M)

OR

16 a. Draw the bode plot for the following function $G(S)H(S)=\frac{5\,(1+2s)}{(1+4S)(1+0.25S)}$ (5M)

b. Derive the resonant peak (Mr) for a second order system (5M)

17 a. Explain the polar plot in methods. (5M)

b.What is Nyquist stability criterion? And also explain relative stability (5M)

OR

18 a. Derive maximum lead angle ϕm and α of a lead compensator. (5M)

b. Compare polar plot and Nyquist plot. (5M)

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)

$$A = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix}$$

OR

20 a. Explain the components in a state space representation. (5M)

b. Write the advantages and dis advantages of state space representation. (5M)