



R17 Regulation

Subject code: 1P4DC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, September 2023

**Control Systems
(ECE)**

Maximum Marks: 70

Date: 19.09.2023 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)

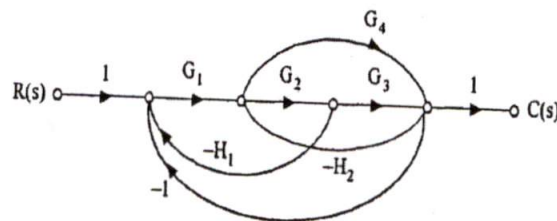
- 1 Define feedback in control system.
- 2 Distinguish between open loop and closed loop systems.
- 3 Define transient responses.
- 4 Define setting time and peak over shoot.
- 5 List the frequency domain specifications.
- 6 Define root locus and bode plots.
- 7 What is use of type number and order of 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 Explain all the block diagram reduction rules and prove them and also write the properties of signal flow graph representation. (10M)
- OR
- 12 Find transfer function $C(s)/R(s)$. (10M)



- 13 Define time domain specifications and also Derive the time response of a second order system for unit step input for underdamped system. (10M)
- OR
- 14 a. Obtain the response of unity feedback system whose open loop transfer function is $G(s) = \frac{k}{s(s+5)}$ and when the input is unit step input (5M)
 - b. Write short notes on effect of PI controller and PD controller (5M)

15 Comment on system stability if the characteristic equation of closed loop system is $S^4+8S^3+18S^2+16S+5=0$. (10M)

OR

16 Draw the bode plot for the following function $G(S)H(S)=\frac{5(1+2s)}{(1+4s)(1+0.25s)}$ (10M)

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 ϕ_m 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 disadvantages of state space representation. (5M)