



R20 Regulation

Subject code: 3P5DB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Regular Examinations, January 2023

CONTROL SYSTEMS (Electronics and Communication Engineering)

Maximum Marks: 70

Date: 20.01.2023 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 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)

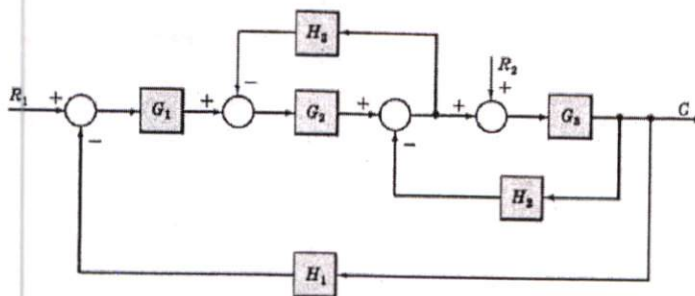
1. Compare open loop and closed loop control systems
2. List out the properties of signal flow graph
3. Define steady state response and steady state error
4. Brief the effects of proportional derivative systems
5. What do you mean by absolute stability and relative stability
6. State the applications of root locus
7. Define phase cross over frequency and phase margin
8. Outline the need of lead compensator.
9. Write the merits of state variable techniques.
10. What is state transmission matrix.

Part-B

Answer All the following questions.

(10MX 5=50Marks)

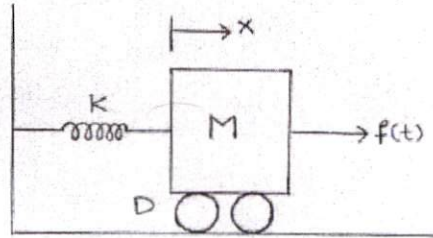
11. A. Explain the necessity and effect of feedback in control systems? [5]
B. Find the transfer function $\frac{C(S)}{R(S)}$ for the block diagram shown in figure. [5]



OR

12. A. State and explain Mason's gain formula used in signal flow graphs. [5]

B. Construct the electrical analog of a mass on wheels coupled to a rigid body as shown in the figure.[5]



- 13 A. A unity feedback control system has an open loop transfer function, $G(s) = \frac{10}{s(s+2)}$. Find the time domain specifications for unit step input. [5]
 B. Write the equations for time domain specifications of a standard second order system with unit step input? [5]
- OR
- 14 A. Derive expressions for the steady state errors of type – 1 and type – 2 systems excited by a unit - parabolic input. [5]
 B. Derive the expression for settling time for a standard second order system with unit step input? [5]
- 15 A. Determine the stability of the system having a characteristic equation: $S^5 + S^4 + 2S^3 + 3S + 5 = 0$ [5]
 B. List all the rules to construct a root locus and explain. [5]
- OR
- 16 Draw the bode plot for the unity feedback system with open loop transfer function $G(S) = \frac{0.5}{s(s^2+s+1)}$. Hence find gain margin and phase margin. [10]
- 17 The open loop transfer function of a unity feedback control system is $G(s) = \frac{K}{(s+1)(2s+1)}$. Use Nyquist stability criterion to determine the critical value of gain 'K' for stability. [10]
- OR
- 18 A. Explain lag compensator.[5]
 B. Sketch the polar plot of $G(s) = sT/(1 + sT)$ [5]
- 19 Explain various methods of evaluation of state transition matrix. [10]
- OR
- 20 A. The state equations of linear systems are as follows. [5]

$$\bar{x} = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -3 & 0 \\ 1 & 1 & 1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u \quad ; y = [2 \ 1 \ -1] x$$

Determine the transfer function $y(s)/u(s)$

- B. Discuss about the properties of state transition matrix. [5]