



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3P4BD

B.Tech IV Semester Regular Examinations, July 2022

CONTROL SYSTEMS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Maximum Marks: 70

Date: 28.07.2022 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)

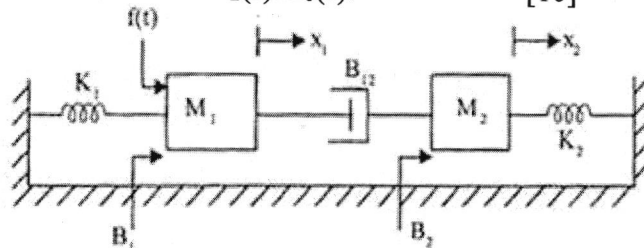
- 1 Obtain the transfer function for the system having forward transfer function (G(S)) with negative feedback transfer function (H(S))
- 2 Distinguish between open loop and closed loop system
- 3 Define rise time and peak time
- 4 Determine the type and order of the system $G(s) = K / \{s(s + 2)\}$
- 5 What is break-away and break-in point?
- 6 Check the stability for the system $\frac{1}{(s+2)(s-3)}$.
- 7 Define polar plot.
- 8 What is the necessity of compensator?
- 9 When a system is said to be completely observable?
- 10 State the condition for controllability by Kalman's method.

Part-B

Answer All the following questions.

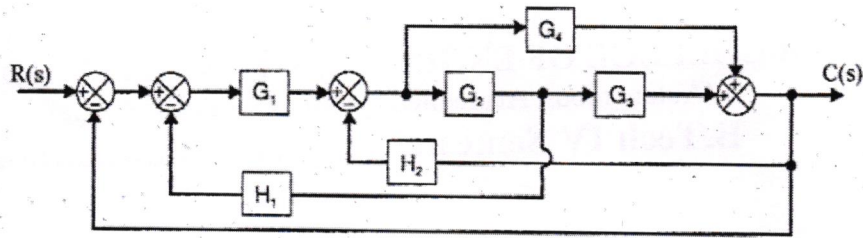
(10MX 5=50Marks)

- 11 Determine transfer function. $X_2(s)/X_1(s)$. [10]



OR

- 12 Convert the System into signal flow graph and obtain the transfer function using Mason's gain formula. [10]



- 13 A unity feedback system has an open loop transfer function by $G(s) = \frac{10}{s(s+2)}$. Find the rise time, percentage overshoot, peak time and settling time. [10]

OR

- 14 Determine the steady state error constants for a unity feedback system whose open loop transfer function is given by $G(s) = \frac{100(s+2)(s+6)}{s(s+4)(s+3)}$. [10]

- 15 Sketch the root locus for the function $G(S) = \frac{K}{s(s+2)(s+5)}$ and determine the range of K for stability. [10]

OR

- 16 Check the stability of the system. $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16$ by routh Hurwitz criterion. Comment on the location of roots. [10]

- 17 Sketch the Bode plot for the system $G(S) = \frac{20}{s(1+s)(1+4s)}$. Also determine gain cross over frequency. [10]

OR

- 18 The open loop transfer function of unity feedback system given by $G(s) = \frac{1}{s(1+s)(1+2s)}$ Sketch the polar plot and determine the gain margin and phase margin. [10]

- 19 Inspect the following system to check whether the system is controllable and observable. [10]

$$\dot{x} = \begin{bmatrix} -2 & -1 & -3 \\ 0 & -2 & 1 \\ -7 & -8 & -9 \end{bmatrix} x + \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} u$$

$$y = [4 \quad 6 \quad 8]x$$

OR

- 20 Compute state transition matrix for given $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$ [10]