(i) Differentiate between controllability and observability.

(j) Differentiate between lead and lag controller.

1.5×10=15

Roll No. ..... **Total Pages : 04**

J-21-0106

B. Tech. EXAMINATION, 2021

Semester VI (CBCS)

CONTROL SYSTEMS

EC-603

Time : 2 Hours *Maximum Marks : 60*

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

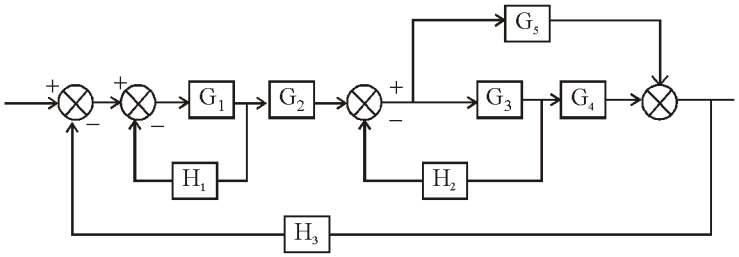
Section A

1. What is system and also compare the open loop system and closed loop system. **15**

2. Differentiate between mathematical modeling of electrical, mechanical and thermal system. **15**

Section B

3. Draw signal flow graph and find the transfer function of the following system using Mason's gain furmula :



15

4. Discuss transient response specifications of second order system control system. **15**

Section C

5. What is Stability ? Explain the effects of adding poles and zeros on the root loci in terms of stabiliy. **15**

6. The open loop transfer function of feedback control system is given by $G(s)H(s) = \frac{K}{(s+1)(2s+1)(3s+1)}$.

Find the value of K such that the gain margin is 20 db. **15**

Section D

7. Define Compensation technique. Explain phase lead compensator with a diagram. **15**

8. Check for controllability and observability of a system having the following coefficient matrices :

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \text{ and } C^T = \begin{bmatrix} 10 \\ 5 \\ 1 \end{bmatrix}. \quad \textbf{15}$$

(Compulsory Question)

9. (a) Give an example of open loop system.

(b) Differentiate between PM and GM.

(c) What is the use of Laplace transform ?

(d) What is control system and why is it required ?

(e) Write two effects of feedback.

(f) Differentiate between time response and frequency response analysis.

(g) What are state models ? Why are they required ?

(h) What do you understand by state ?