6TH SEM./ELECTRICAL / 2024(S)

Th-3 Control System Engineering

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks & Use Calculator

1. Answer **All** questions 2 x 10

   a. How do you define Transfer Function?

   b. Define Signal Flow Graph (SFG) & write two properties of SFG.

   c. Write the effect of Negative feedback in control system.

   d. How do you mean by **Order** and **Type** of a system?

   e. State the Mason's gain formula.

   f. What is the main objective of Root-Locus analysis Technique?

   g. How do you define relative stability?

   h. Write the effect of adding poles to closed loop control system.

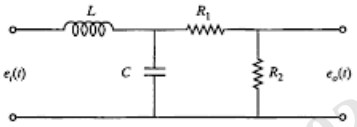
   i. Give two disadvantages of closed loop control over open loop control system.

   j. Define Peak Time and settling time.

2. Answer **Any Six** Questions 6 x 5

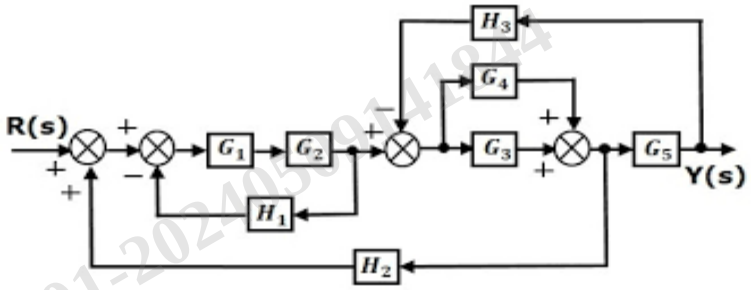
   a. Derive the expression for peak time and setting time for the under damped second order system with unit step input.

   b. Obtain the Transfer Function for the given electrical system



   c. Explain details of PD controller used in control system.

   d. Obtain the Transfer Function of a given system using Block Diagram Reduction Technique.



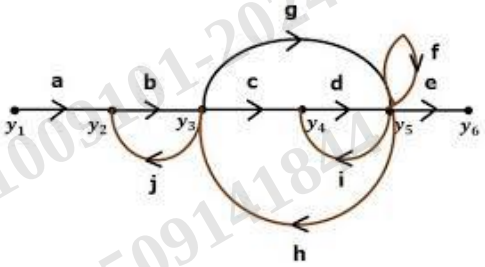
e. Explain details of Nicholas Chart used in control system.

f. State difference between open loop and closed loop control system.

g Write short note on Constant M and N circle in brief.

3 Describe construction and working principle of Synchros. Also explain how it is used in servo application. 10

4 Obtain the closed loop transfer function of the system C(S)/R(S) using Masson's gain formula 10



5 Sketch the Root-Locus of the system whose transfer function is given by 10

$$G(s)H(s) = \frac{\mathrm{K}}{\mathrm{s(s+3)(s+5)}}$$

6 Describe with neat block diagram the working of armature controlled DC motor as a control system. 10

7 The open loop transfer function of the plant is 10

$$\mathrm{G(s)H(s)} = \frac{10(\mathrm{s}+2)}{\mathrm{s}^2(\mathrm{s}+10)}$$

Use Bode Plot, Find the Gain Margin and Phase Margin.