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Total No. of Pages : 03

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B.Tech.(EE)PT (Sem.–4)

LINEAR CONTROL SYSTEMS

Subject Code : BTEE-402

M.Code : 72448

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a) Discuss the relative merits and demerits of closed loop systems with respect to open loop systems.

b) Discuss the significance of gain and phase margin in control engineering.

c) What is type and order of a system?

d) Sketch the electrical circuit of lag-lead compensator.

e) Differentiate between over-damped, critically damped and under-damped systems.

f) State limitations of frequency domain approach.

g) What is compensating network and why is this used?

h) Write down salient features of root locus plot.

i) What are the advantages of servo motors?

j) What are the basic properties of signal flow graph?

SECTION-B

2. Discuss the Routh-Hurwitz criteria for determining the stability of a control system and calculate the range of K for stable operation of following characteristic equation.

$$s^4 + 4s^3 + 13s^2 + 36s + K = 0$$

3. The closed loop transfer function of a unity feedback control system is given by

$$\frac{C(s)}{R(s)} = \frac{5s+10}{s^2+6s+10}$$

Determine the steady state error for unit ramp input.

4. Explain the operation of a control synchro system and how it is used to control a servo system.

5. Convert the following block diagram into signal flow diagram.

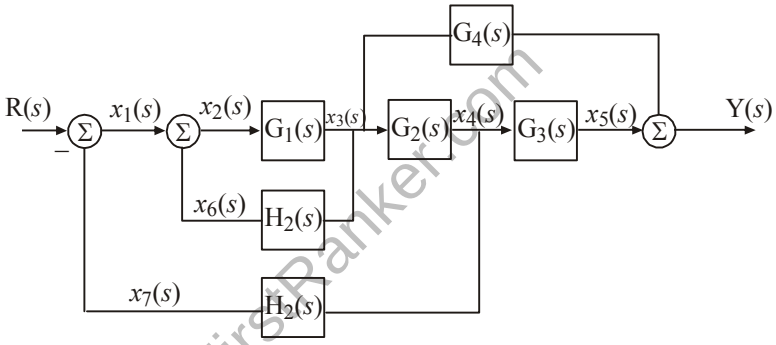

Fig.1

Also obtain its transfer function after simplifying the signal flow diagram.

6. Draw the circuit diagram of a Lag compensator and obtain its transfer function.

SECTION-C

7. Derive the time response of a second order control system $\frac{C(s)}{R(s)} = \frac{\omega_n^2}{s^2 + 2\zeta\omega_n + \omega_n^2}$ subjected to impulse input function δ(t).

8. What information can you obtain from the root locus ? Explain the method of calculating the breakaway points. Draw the root locus plot for a system with

$$G(s)H(s) = \frac{k}{s(s^2 + 4s + 10)}$$

Determine the angles of departure and the approximate positions of closed loop poles approximate positionos of closed loop poles for k = 10

9. A unity feedback system is characterized by the open loop transfer function

$$G(s)\frac{1}{s(1 + 0.5s)\,(1 + 0.2s)}$$

Determine the steady state error for unit step, unit ramp and unit acceleration input. Also, determine the damping ratio and natural frequency of the dominant roots.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.