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Total No. of Questions : 09] [Total No. of Pages : 02

Paper ID [A0310]

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B.Tech. (Sem. - 4th)

LINEAR CONTROL SYSTEMS (IC - 204)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 x 2 = 20)*

a) What is meant by Continuous and Discrete data systems?

b) State significance and four properties of transfer function.

c) Give advantages and disadvantages of block diagram reduction technique.

d) Define rise time and delay time for a second order system.

e) State Routh stability criteria and give its significance.

f) What is meant by overdamped and underdamped system?

g) Define Critically and Conditionally stable system.

h) What do you mean by bounded input, bounded output stability of a system?

i) Give advantages and limitations of Nyquist method.

j) What is the effect of lag-lead compensator?

Section - B

(4 x 5 = 20)

Q2) With the help of suitable example differentiate between

(a) Time variant and Time invariant systems.

(b) Open and Closed loop systems.

(c) Linear and Non-linear systems.

Q3) Draw the heat transfer system and obtain its transfer function.

Q4) State how steady state error of a control system is determined? How it can be reduced?

Q5) Determine the stability of a system with characteristic equation.

$$S^5 + 4S^4 + 2S^3 + 8S^2 + S + 4 = 0$$

Q6) Compare the characteristics of three types of compensators.

Section - C

(2 x 10 = 20)

Q7) 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 angles of departure and the approximate positions of closed loop poles for $k = 10$.

Q8) State the advantages of Bode plots. Determine the value of K in the transfer function given below such the

(a) The gain margin is 20 dB

(b) The phase margin is 30°

$$G(jw)\,H(jw) = \frac{k}{jw(j0.1w + 1)(j0.05w + 1)}$$

Q9) Sketch the Nyquist plot for system with

$$G(s)\,H(s) = \frac{(1 + 0.5s)}{s^2(1 + 0.1s)(1 + 0.02s)}$$

Comment on the stability.