

Please check that this question paper contains 9 questions and 2 printed pages within first ten

MORNING

[Total No. of Questions: 09]

27 MAY 2024

[Total No. of Pages: 02]

Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester: 4th

Name of Subject: Linear Control Systems

Subject Code: PCEC-109

Paper ID: 16225

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) Define control system.
- b) List down two advantages of Nyquist plots.
- c) Why is compensation required?
- d) Find the steady state error for unit ramp input for a type-1 system.
- e) Inspect the given transfer function and write it in standard form transfer function for Bode plot.

$$G(s)H(s) = \frac{(s + a)(s + b)}{(s + p)(s + q)}$$

- f) Evaluate the transfer function of Low Pass Filter system.

Part – B

[Marks: 04 each]

- Q2.** Discuss about open loop and closed loop systems with appropriate examples.
- Q3.** With the help of mechanical translation system diagram explain D'Alembert's Principle.
- Q4.** List disadvantages of Hurwitz determinant and explain how is Routh array criterion helpful to determine the stability of control system.

- Q5. When a second order control system is subjected to a unit step input, the values of $\xi = 0.5$, $\omega_n = 6 \text{ rad/sec}$. Determine the rise time, peak time, settling time and peak overshoot.
- Q6. Determine phase from the given transfer function and sketch phase bode plot for the given unity feedback system

$$G(s)H(s) = \frac{1000}{s(1 + 0.1s)(1 + 0.001s)}$$

- Q7. Develop the transfer function of a lag compensator network.

Part – C

[Marks: 12 each]

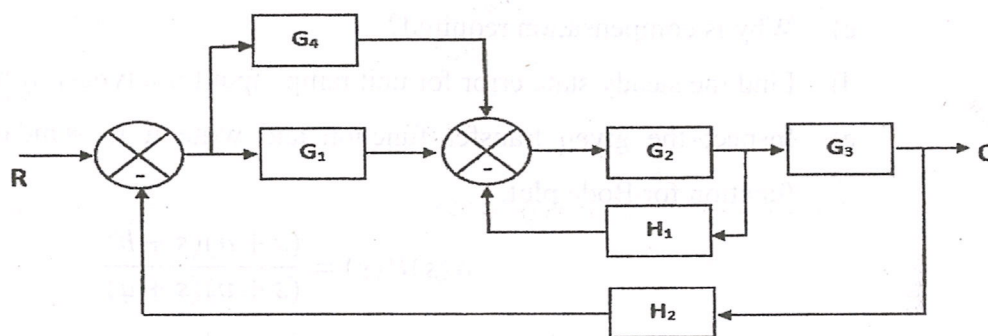
- Q8. Explain the following Block Diagram reduction rules

- Feedback loop
- Shifting a summing point before a block
- Shifting a take-off point after a block
- Shifting a take-off point after a summing point

OR

Explain AC and DC Techno Generators in detail.

- Q9. Analyze the signal flow graph and find overall gain using Mason's gain formula



OR

The forward path transfer function of a unity feedback system is given by

$$G(s) = \frac{k}{s(s + 4)(s + 5)}$$

Sketch the root locus as k varies from 0 to ∞ .
