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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2012 & Onward) (Sem.-4)

LINEAR CONTROL SYSTEMS

Subject Code : BTEE-402

M.Code : 57108

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

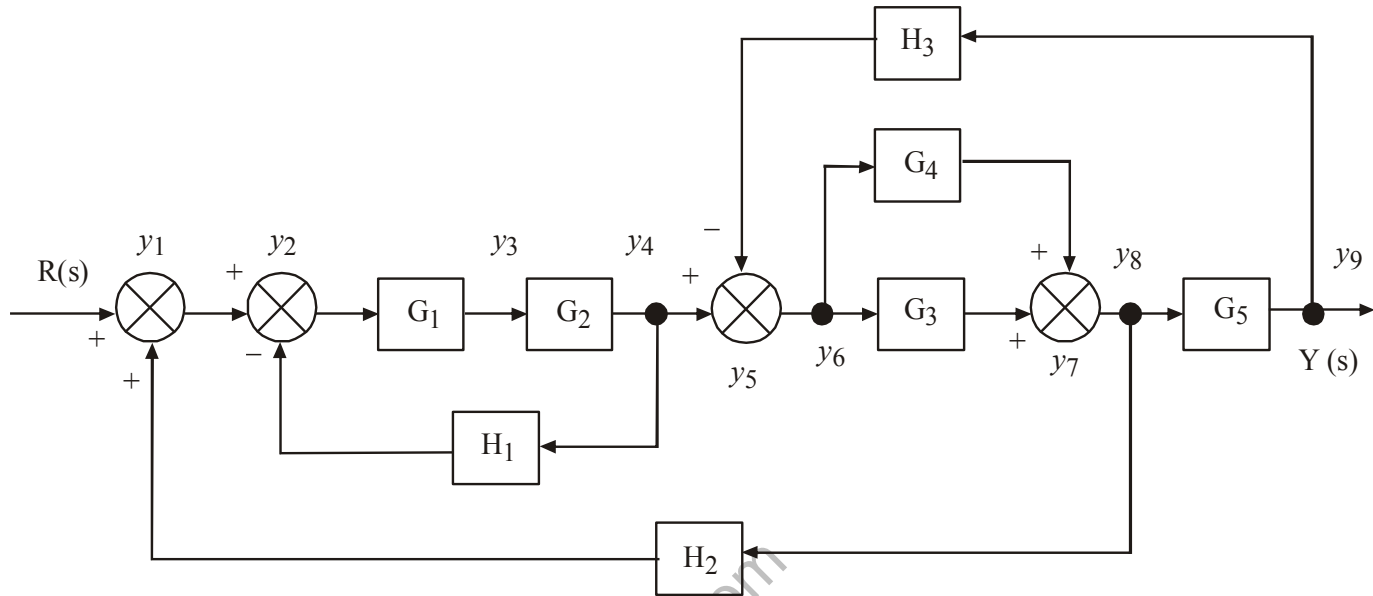
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**Q1. Answer briefly :**

- a) Define ramp signal.
- b) What are the standard test signals employed for time domain studies ?
- c) What is transient response ?
- d) What is a lag lead compensator ?
- e) Give the limitations of frequency response analysis.
- f) Define a decade in bode plot.
- g) What are frequency domain specifications ?
- h) What is function of error detector in control system ?
- i) Define phase-cross over frequency.
- j) Why the zeros on the real axis near the origin are generally avoided in design ?

SECTION-B

- Discuss sampled data control system with the help of a block diagram. Write its advantages and disadvantages.
- Convert the following block diagram into its equivalent signal flow graph.



- State how steady state error of a control system is determined ? How it can be reduced ?
- Discuss the working of a servo motor with the help of suitable diagram.
- What is a multivariable system ? Discuss with a suitable example. Also discuss issues in the analysis and design of multivariable control systems.

SECTION-C

- Sketch the Nyquist plot for the system with the open loop transfer function

$$G(s) = \frac{K}{(s + 1)(s + 1.5)(s + 2)}$$

and determine the range of K for which the system is stable.

8. What information can you obtain from the root locus? Explain the method for 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 the closed loop poles for $k = 10$.

9. Design a suitable lead compensator for a system with unity feedback and having open loop transfer function $G(s) = \frac{4}{s(s+1)(s+4)}$ to meet the specifications

- Damping ratio = 0.5.
- Undamped natural frequency = 2 rad/sec.

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.