This question paper contains 4 printed pages.

3296 *Your Roll No.*.....

B.Tech (E) / III

J

Paper- IV : CONTROL SYSTEMS ENGINEERING
(EEC / EEE - 304)

Time : 3 hours *Maximum Marks :70*

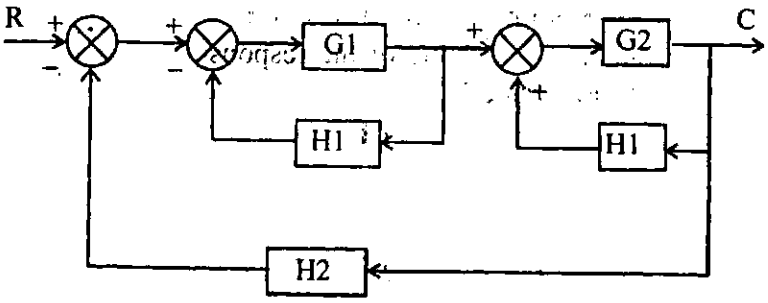
(Write your Roll No. on the top immediately on receipt of this question paper.)

Special Material : Two semi-log graph papers of each student.

Attempt any five questions.
All questions carry equal marks.

1. (a) We know that most of the practical control systems are non linear in nature, still we study Linear Control System Analysis in details. Explan why ? *04*

   (b) Determine the C/R ratio of the system represented by the following block diagram. *10*



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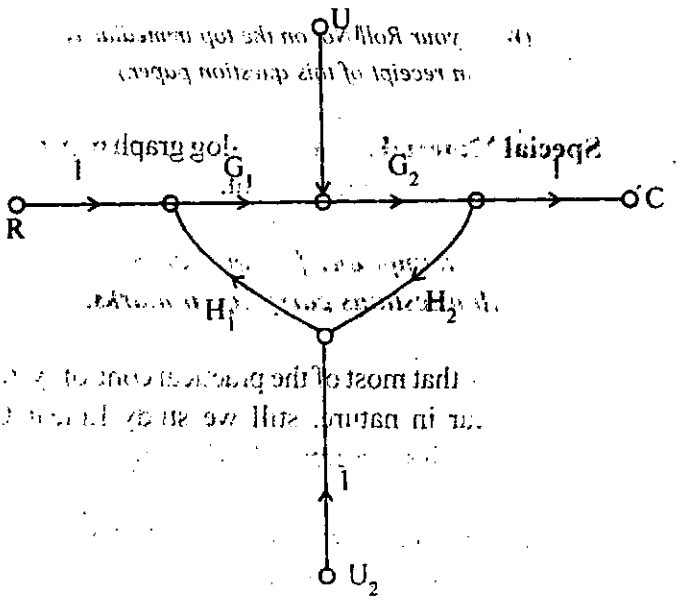
2. (a) Compare the block diagram approach and signal flow graph approach for analysis of linear control systems. *04*

(b) Find the expression for C when all the inputs are present for the following signal flow graph. *10*



(a) How can you define the term Maximum Percent Overshoot of a control system in which the final steady state value of the response differs from the desired value? *04*

(b) The differential equation describing the dynamics of a second order control system is

$$15\frac{d^2y}{dt^2} + 12\frac{dy}{dt} + 6y = 6x$$

Determine analytically

(i) the maximum overshoot of the response.

(ii) the time at which this maximum overshoot occurs when the system is subjected to a unit step input. *10*

4. Draw the root - loci of a closed - loop control system having following open - loop transfer function.

$$G(s)\,H(s) = \frac{K(s^2 - 2)}{(s^2 + 2)(s^2 + 4)}$$ *14*

5. (a) Explain the Rith's procedure to test a polynomial for the location of its roots in a complex plane. *04*

(b) Using Routh - Hurwitz criterion determine the stability of the system with the following characteristic equation. Also find out the number of poles located in the right half of s - plane.

$s^2 + 2s^2 + 4s + 9 = 0.$ *10*

6 (a) Why logarithmic scales are used for drawing the Bode diagram for frequency response of any system ? *04*

(b) Draw the asymptotic Bode plots for the following open - loop transfer functions. Also determine gain margin and phase margin.

$$\frac{0.5}{s(s^2 + s + 1)}$$ *10*

7 (a) Discuss the input - output characteristics of a magnetic amplifier. *04*

(b) Explain the constructional features and principle of working of a gyro. *10*

8. Write notes on any two of the following :
   (i) Static error coefficients.
   (ii) Effect of feedback.
   (iii) Basic Control Actions. *14*