B.Tech Degree VI Semester Examination
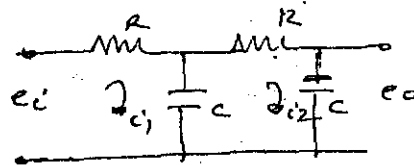## May 2003

CS/EC/EB/EI 605 CONTROL SYSTEM ENGINEERING
(1999 Admissions onwards)
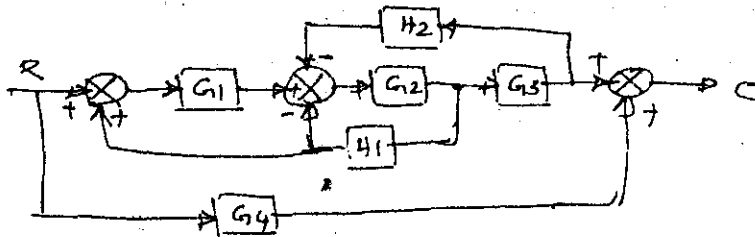
Time: 3 Hours   Maximum Marks: 100

I.   (a)   What is meant by Transfer function of a system ?   (3)
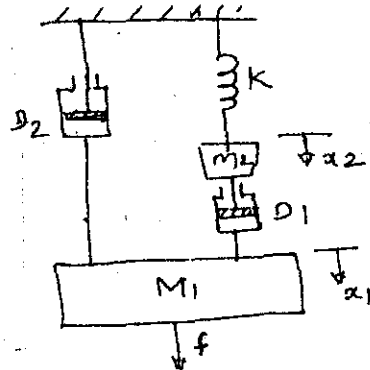   (b)   Determine the Transfer function of the system given below:

(7)

      (c)   (i)   Determine the ratio C/R by block diagram reduction technique

(7)

             (ii)   What is Mayson's gain formula ?   (3)
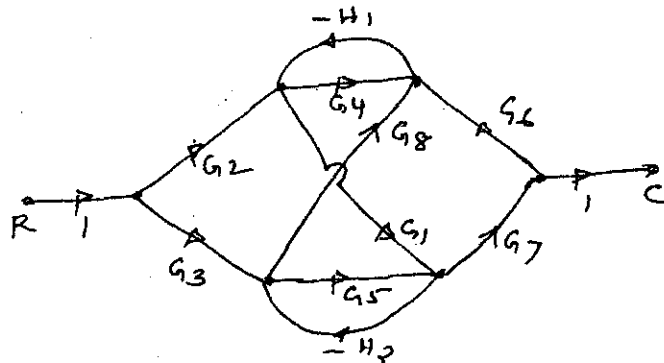
                                    OR

II.   (a)   (i)   Write down the equations
                    representing the mechanical
                    system shown in figure.

(5)

             (ii)   What is force-voltage and force-current analogy ?   (5)
      (b)   Obtain the overall transfer function of the signal flow graph shown in figure.

(10)

(Turn Over)

III. (a) Draw the response of a 2nd order system to a unit step input. Derive the expression for peak overshoot, rise time, and settling time. (12)

(b) Consider the unity feedback system in which $G(s) = \dfrac{25}{s(s+5)}$. Obtain the rise time, peak overshoot, end settling time when subject to step input. (8)

OR

IV. (a) What is meant by steady state error ? What are static error coefficient ? How will you determine them? (10)

(b) What are the effects of derivative and integral control in a control system ? (3)

(c) Explain Routh Hurwitz criterion by considering a suitable example. (7)

V. (a) A certain unity feed back control system in given by $G(s) = \dfrac{k}{s(1+s)(1+0.1s)}$.

Draw the Bode plot. Determine the value of k so that
gain Margin = 10db
phase margin = 50° (12)

(b) Explain Nyquist Criterion. (8)

OR

VI. (a) What is meant by frequency response ? Explain the performance characteristics in frequency domain. (10)

(b) What are constant M and N circles ? Explain Nichol's chart. (10)

VII. (a) Explain the different steps in drawing root locus. (10)

(b) A unity feedback system has $G(s) = \dfrac{k}{s(s+4)(s^2+2s+5)}$
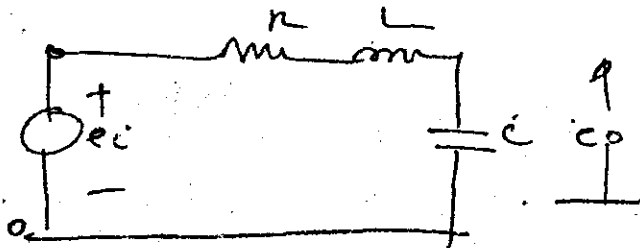
Draw the root locus. (10)

OR

VIII. (a) What are compensating networks ? (8)

(b) Explain the design procedure for a cascade lead compensation. (12)

IX. (a) Define state variables, state and stace space of a system. (4)

(b) Determine the state mode of a system shown in fig.

(10)

(c) What is a servomotor ? Mention some of its applications. (6)

OR

X. (a) What is a state Transition Matrix ? Explain its properties. (10)

(b) Solve the state equation

$$X' = \begin{bmatrix} 0 & 0 & -2 \\ 0 & 1 & 0 \\ 1 & 0 & 3 \end{bmatrix} X; \quad X(0) = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

(10)

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