Code No: NR411503 **NR**

IV B.Tech I Semester Supplementary Examinations, April/May 2005
CONTROL ENGINEERING
(Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Obtain the transfer function of the mechanical system shown in figure 1.
   (b) Obtain the transfer function for the following figure 2 electrical network.

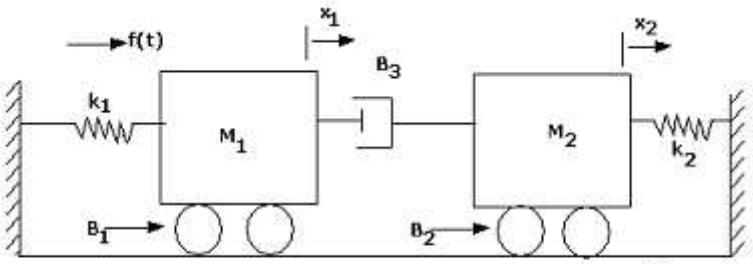


figure 1

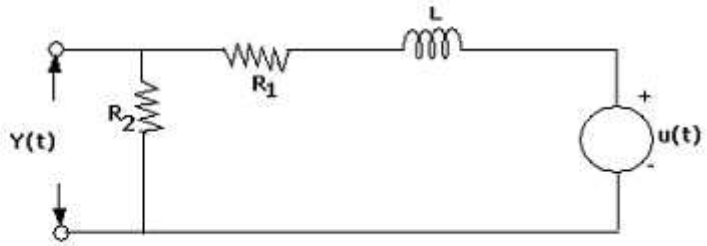
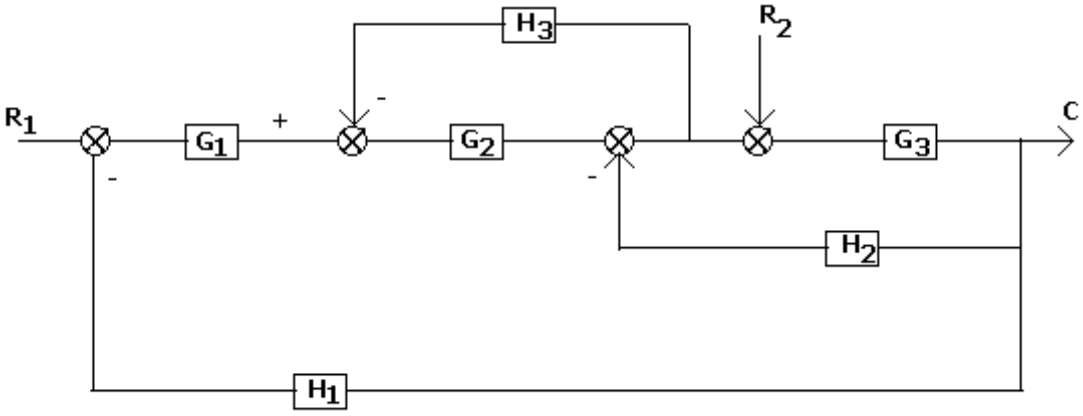


figure 2

2. Obtain the out put of the system shown in figure using block diagram reduction techniques.



3. (a) Explain the working of potentio meter with neat diagram.

(b) Explain the working of A.C. servomotor.

4. (a) Find the unit step response of a unity feed back system whose open loop transfer function is $G(s) = \frac{4}{S(S+5)}$

   (b) A unity feed back system is characterized by an open loop transfer function. $G(s) = \frac{K}{S(S+10)}$
   Determine gain 'K' so that the system will have a damping ratio of 0.5. for this value of 'K' determine M_p, t_p, and t_s.

5. (a) The servomechanism is characterized by the differential equation $\frac{d^2c}{dt^2} + 6.4\frac{dc}{dt} + 160[0.4c - r] = 0$. Find the value of damping ratio.

   (b) Find the step, ramp, parabolic error coefficients for the following functions.

   i. $\frac{50}{(1+0.1S)(1+2S)}$

   ii. $\frac{K}{S(S+3)(S+25)}$

6. The open loop transfer function of a unity feed back system is $G(s) = \frac{K}{S(S+1)}$
   It is desired to have the velocity error constant $K_V = 12sec^{-1}$ and phase marging as 40^0. Design a lead compensator to meet the above specifications.

7. A system is characterized by the following state space equations.
$$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \quad : t > 0$$
$$Y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

   (a) Find the T.F. of the above system

   (b) Compute the state transition matrix

   (c) Solve the state equations for a unit step input under zero initial conditions.

8. (a) Explain the gain margin and phase margin.

   (b) State masons gain formula.

   (c) State Myquist stability criteria.

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