CS: SE-IV SEM : EXTC : CBSGS 140 copies

12/06/15

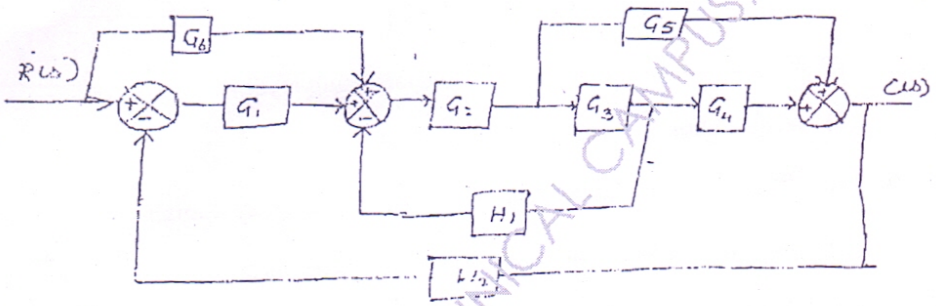
Q.P. Code : 3624

(3 Hours) **[Total Marks : 80**

N. B.: (1) Question No. 1 is compulsory.
(2) Attempt any three questions from remaining five questions.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

1. Attempt the following 20
   (a) Differentiate open-loop and closed-loop systems.
   (b) Explain Mason's gain formula
   (c) What is optimal control? What the advantages and disadvantages of optimal control.
   (d) Define gain and phase margin. Explain how to find gain margin and phase margins using polar plot.

2. (a) Find the transfer function of the block diagram shown in figure by using block diagram reduction method 10

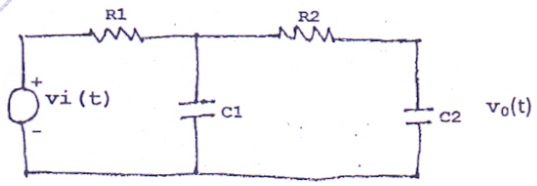


   (b) Construct the root locus having following open loop transfer function. 10

$$G(s)H(s) = \frac{K(s+4)}{(s+0.5)^2(s+2)}$$

   Find range of K for the system to be stable.

3. (a) Find the transfer function of the electrical network shown in figure. Also obtain the state space model. 10



   (b) Check whether the system is stable or not 05

$$s^6 + 3s^5 + 2s^4 + 9s^3 + 5s^2 + 12s + 20 = 0$$

   (c) State and prove properties of state transition matrix. 05

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4. (a) The open-loop transfer function of a control system is 10

$$G(s)H(s) = \frac{0.5s+1}{s(1+0.1s)(1+0.2s)}$$

Determine approximate values of gain and phase margins.

(b) For the system described by the following state equation, determine the step response of the system 10

$$\dot{x} = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u; \qquad y = [0 \quad 1] u$$

5. (a) Determine the controllability and observability properties of the following system 10

$$\dot{x} = \begin{bmatrix} 1 & 1 & 0 \\ 0 & -2 & 1 \\ 0 & 0 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ -2 \end{bmatrix} u; \qquad y = [1 \quad 0 \quad 0] x$$

(b) Write a short note on stability analysis using Nyquist criterion. 05

(c) Write a short note on adaptive control. 05

6. (a) Explain the correlation between time and frequency domain specifications. 08

(b) Derive the equation for solution of homogeneous system. 07

(c) Explain different time domain specifications. 05

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Course: S.E. (SEM. IV)(CBSGS)(E& TC)(PROG 791 TO 805)

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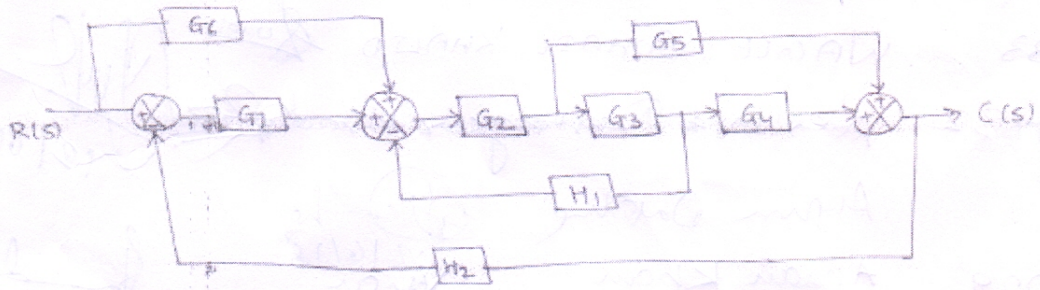
Correction:



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Q.2 (a)

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