Code: R7220402

R7

B.Tech II Year II Semester (R07) Supplementary Examinations, April/May 2013

CONTROL SYSTEMS

(Common to EEE, ECE, E.Con.E and ECC)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

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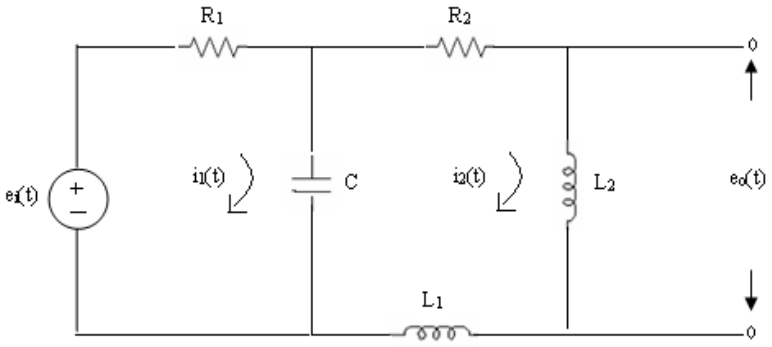
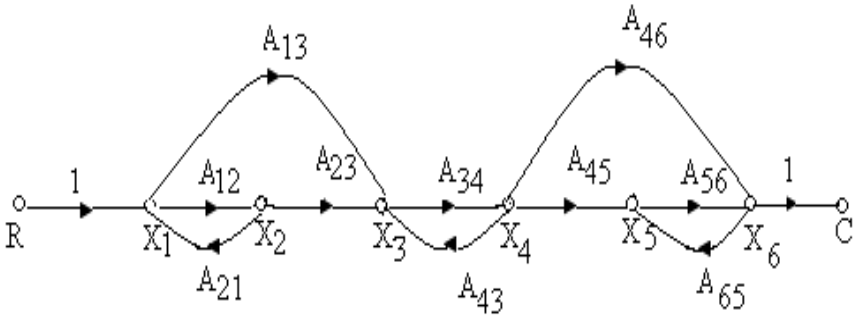
1 (a) Explain the limitations of closed loop systems over open loop systems.

(b) Find the transfer function of the network shown in figure.



2 Find the transfer function of the system whose signal flow graph is shown in the figure.



3 (a) How steady-state error of a control system is determined? How it can be reduced?

(b) For a unity feedback control system the open loop transfer function:
$G(s) = 10(s+2)/ s^2(s+1)$.
Find the position, velocity and acceleration error constants.

4 (a) Explain the Routh-Hurwitz criterion to determine the stability of the system.

(b) Examine the characteristic equation $s^4 + 2 s^3 + s^2 + 4s + 2 = 0$ for stability.

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5 (a) Define the following terms:
(i) Resonant peak. (ii) Resonant frequency.
(iii) Band width. (iv) Cut off rate.

(b) Draw the Bode phase plot for the system having the following transfer function:
G(s) = 2000(s+1)/[s(s + 10) (s + 40)].

6 Explain the concept and construction of polar plots.

7 (a) What is the need for compensation? What are the advantages and disadvantages of frequency domain design?

(b) What is PID controller? What are its effects on system performance?

8 Consider the control system with state model:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} [u] \; ; \; \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$; u = unit step.

Compute the state transition matrix and there from find the state response, i.e, x(t) , t>0.

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