Code No: 07A4EC03 **R07** **Set No. 2**

II B.Tech II Semester Examinations,APRIL 2011
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, ECE, EEE

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

Answer any FIVE Questions
All Questions carry equal marks

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1. For the unity feed back control system forward path transfer function G(S) = K/S (S+4) (S+20). Design a lag-lead compensator so that PM $\geq$ 40 and steady state error for unit ramp input $\leq$ 0.04 rad. [16]

2. (a) State how the type of a control system is determined? How it effects the steady-state error of the system?
   (b) A unity feed-back system has $G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$. Determine
      i. Type of the system?
      ii. All the error coefficients?
      iii. Error for ramp input with magnitude. [6+10]

3. (a) Define the the following terms
      i. absolute stability
      ii. marginal stability
      iii. conditional stability
   (b) By means of RH criterion determine the stability of the system represented by the characteristic equation $S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$
   (c) State the advantages of RH Stability criterion? [6+6+4]

4. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 4a). [9+7]

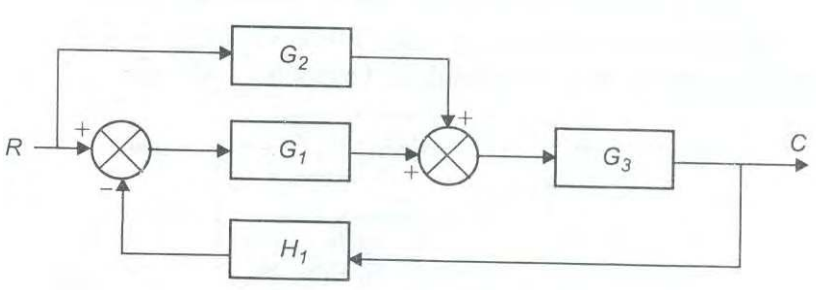

Figure 4a

   (b) Explain the properties of signal flow graphs.

5. (a) Explain the selection criteria of Nyquist contour in stability analysis of linear control systems.
   (b) Discuss the effect of adding poles& zeros on the stability of a system with the help of Nyquist plots. [8+8]

6. (a) Explain the significance of Bandwidth in the design of linear control systems.
   (b) Show that the error contributed by a simple pole in the Bode magnitude plot is -3 dB at corner frequency.
   (c) The asymptotic plot of a system is shown in figure 3c

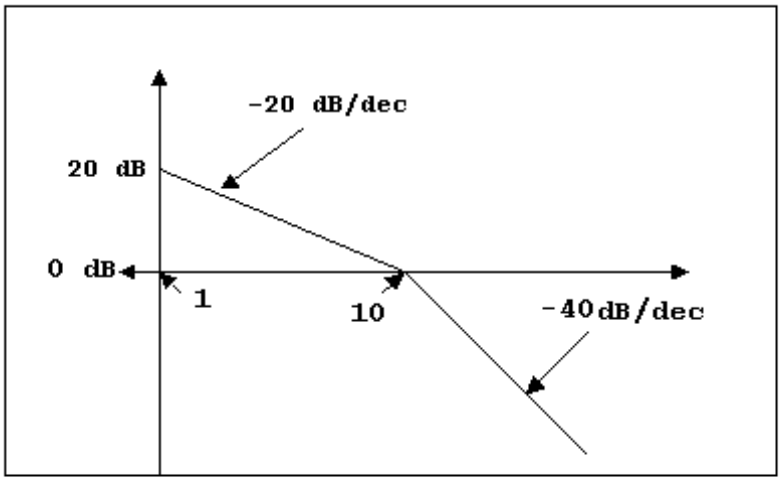

Figure 3c

Find the loop transfer function of the system. [4+4+8]

7. (a) Explain the effect of feedback on stability.
   (b) Explain the temperature control system concepts using open loop as well as closed loop system. [8+8]

8. (a) Consider the network shown in figure 7a and obtain the state variable form ?

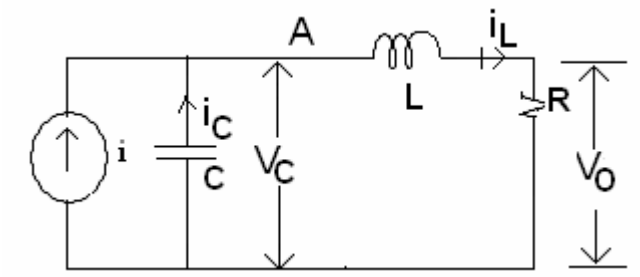

Figure 7a

   (b) A linear time in variant system is characterized by homogenous state equation

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

   Compute the solution of homogenous equation , assuming the initial state vector. [8+8]

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Code No: 07A4EC03 **R07** **Set No. 4**

II B.Tech II Semester Examinations,APRIL 2011
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, ECE, EEE
Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 4a). [9+7]

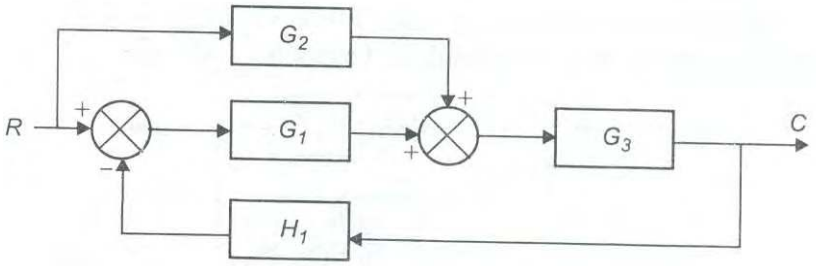

Figure 4a

(b) Explain the properties of signal flow graphs.

2. (a) Explain the effect of feedback on stability.
(b) Explain the temperature control system concepts using open loop as well as closed loop system. [8+8]

3. (a) State how the type of a control system is determined? How it effects the steady-state error of the system?
(b) A unity feed-back system has $G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$. Determine
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   ii. All the error coefficients?
   iii. Error for ramp input with magnitude. [6+10]

4. (a) Consider the network shown in figure 7a and obtain the state variable form ?

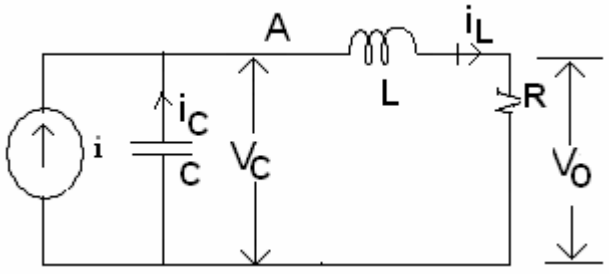

Figure 7a

(b) A linear time in variant system is characterized by homogenous state equation

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Compute the solution of homogenous equation , assuming the initial state vector. [8+8]

5. (a) Define the the following terms
   i. absolute stability
   ii. marginal stability
   iii. conditional stability

   (b) By means of RH criterion determine the stability of the system represented by the characteristic equation $S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$

   (c) State the advantages of RH Stability criterion? [6+6+4]

6. (a) Explain the selection criteria of Nyquist contour in stability analysis of linear control systems.

   (b) Discuss the effect of adding poles& zeros on the stability of a system with the help of Nyquist plots. [8+8]

7. For the unity feed back control system forward path transfer function G(S) = K/S (S+4) (S+20). Design a lag-lead compensator so that PM $\geq$ 40 and steady state error for unit ramp input $\leq$ 0.04 rad. [16]

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   (b) Show that the error contributed by a simple pole in the Bode magnitude plot is -3 dB at corner frequency.

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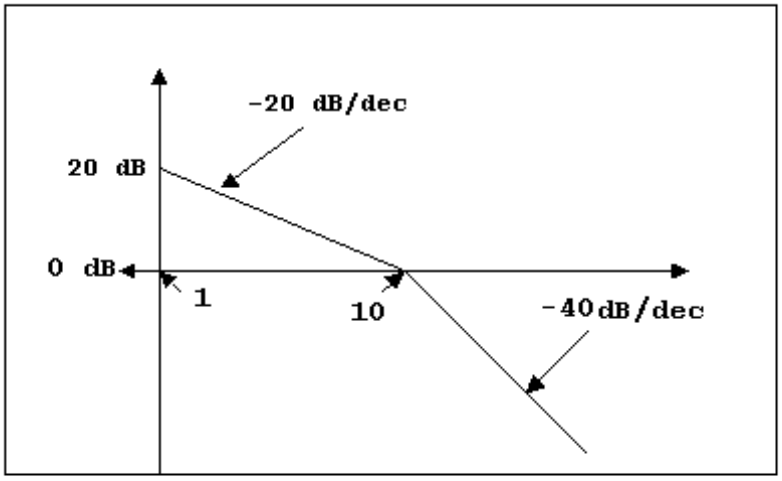

Figure 3c

Find the loop transfer function of the system. [4+4+8]

Code No: 07A4EC03 **R07** **Set No. 4**

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Code No: 07A4EC03 **R07** **Set No. 1**

II B.Tech II Semester Examinations,APRIL 2011
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, ECE, EEE
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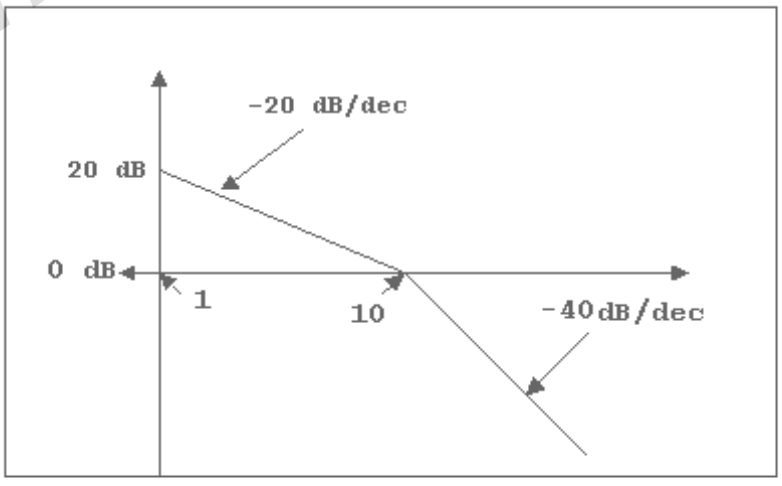

Figure 3c

Find the loop transfer function of the system. [4+4+8]

4. (a) Explain the effect of feedback on stability.

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6. (a) Consider the network shown in figure 7a and obtain the state variable form ?

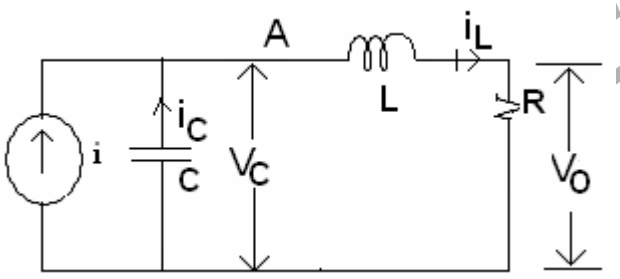

Figure 7a

(b) A linear time in variant system is characterized by homogenous state equation

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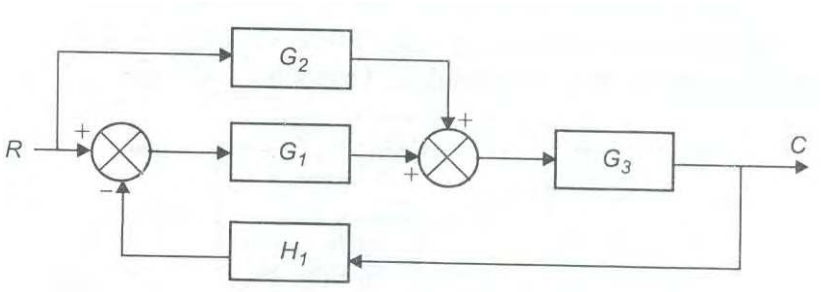

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8. (a) Explain the selection criteria of Nyquist contour in stability analysis of linear control systems.

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Code No: 07A4EC03 **R07** **Set No. 1**

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Code No: 07A4EC03 **R07** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
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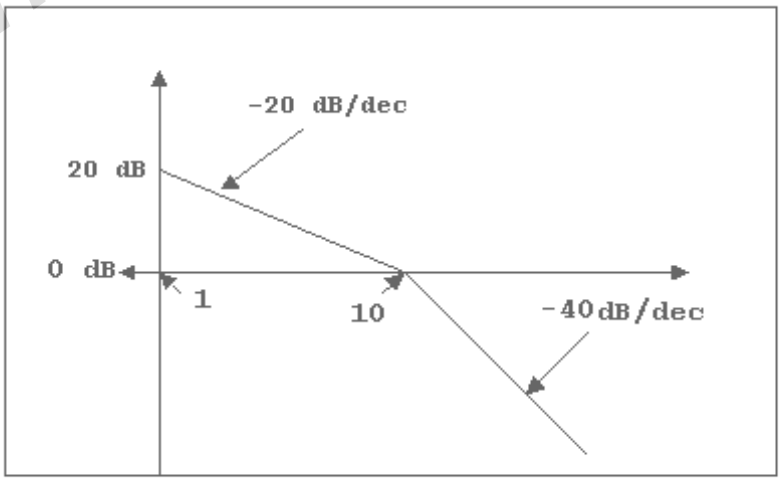

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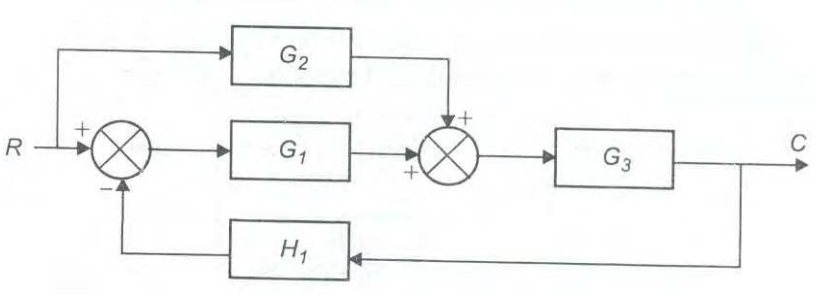

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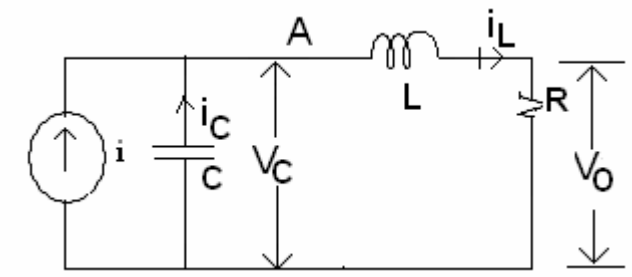

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