Code No: R05220205 **R05** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Design a phase lead compensator for unity feed back system whose open loop transfer function $\frac{K}{S(S+1)}$. The system has to satisfy the following specifications.
   (a) The phase margin of the system $\geq 45^o$.
   (b) Steady state error for a unit ramp input. $\leq 1/15$
   (c) The gaincrossover frequency of the system must be less than 7.5 rad/sec. [16]

2. (a) Find the transfer function for the following mechanical system: Shown in figure 3a

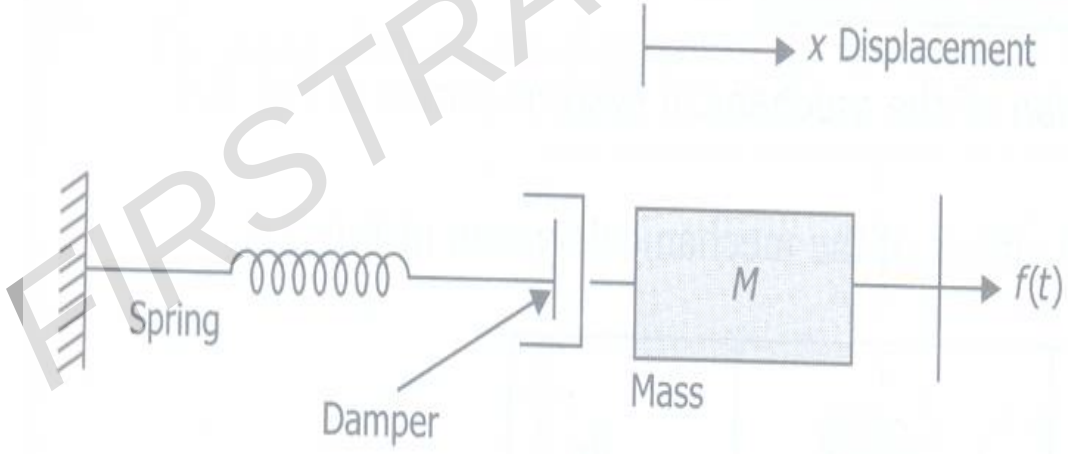

Figure 3a

   (b) Explain the limitations of closed loop system over open loop system. [10+6]

3. (a) Given $G(s) = \frac{42.77}{s(s+6.54)}$ If r(t) = 6.8 Sin 4t find the output at steady state.
   (b) Write a brief note on log-magnitude vs phase plots.
   (c) In Bode plots if gain cross over frequency is greater than phase cross over frequency then the system is UNSTABLE. Elaborate. [8+4+4]

4. (a) What are the necessary conditions to have all the roots of the characteristic Equation in the left half of s-plane?
   (b) What are the difficulties in RH stability crititerion? Explain, how you can over come them? [4+12]

5. (a) Establish the relation relation between ξ and M_p for a step response of a second order system?

(b) A system is given by differential equation $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+8y=8x$, where y=output x= input. Determine all the time domain specifications and obtain output response for unit step input ? [3+13]

6. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 6a)

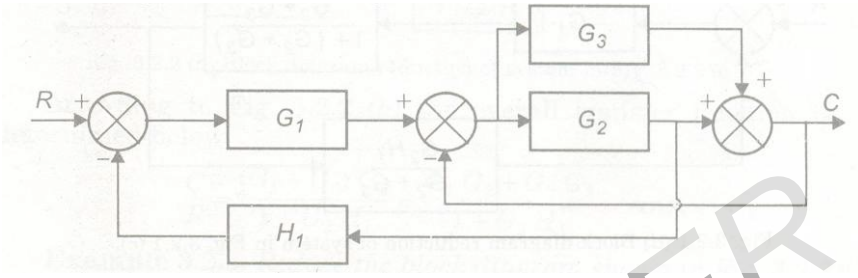

Figure 6a

(b) Define various terms involved in signal flow graphs. [10+6]

7. (a) Explain how the type of a system determines the shape of polar plot

(b) Write a note on Nyquist criterion for minimum phase & non minimum phase transfer functions. [8+8]

8. (a) A control system is described by the differential equation $\frac{d^3y}{dt^3}(t) = u(t)$. Where y (t) is observed output and u(t) is the input.

i. Describe the system in the state variable form $\dot{x} = Ax+Bu,\ \dot{y} = Cx+Du$.

ii. Calculate the state transition matrix e^{At} of the system.

(b) A linear system is described by the following transfer function $G(S) = \frac{S+1}{(S+2)^2(S+5)}$ Draw the state transition signal flow graphs using canonical form of decomposition. [10+6]

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Code No: R05220205 **R05** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE
Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 6a)

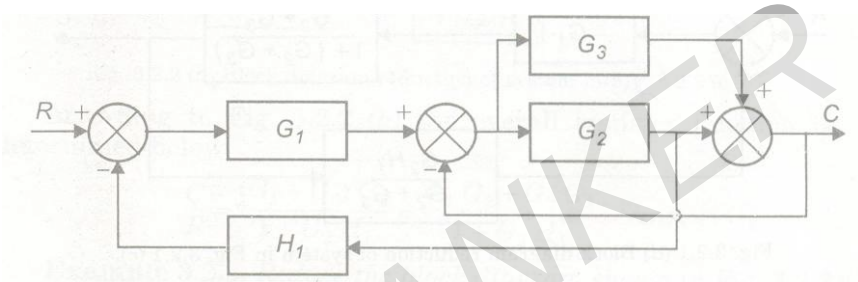

Figure 6a

(b) Define various terms involved in signal flow graphs. [10+6]

2. Design a phase lead compensator for unity feed back system whose open loop transfer function $\frac{K}{S(S+1)}$. The system has to satisfy the following specifications.
   (a) The phase margin of the system $\geq 45^o$.
   (b) Steady state error for a unit ramp input. $\leq 1/15$
   (c) The gaincrossover frequency of the system must be less than 7.5 rad/sec. [16]

3. (a) Find the transfer function for the following mechanical system: Shown in figure 3a

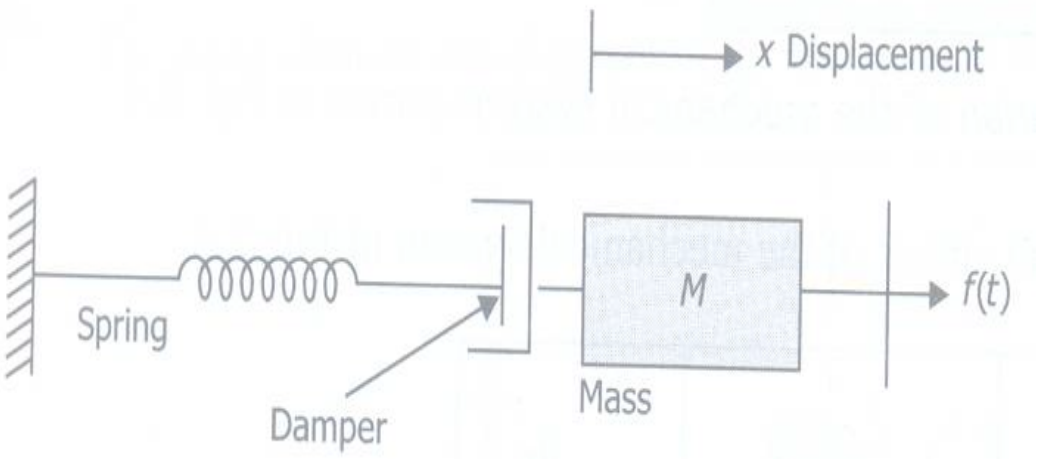

Figure 3a

(b) Explain the limitations of closed loop system over open loop system. [10+6]

4. (a) What are the necessary conditions to have all the roots of the characteristic Equation in the left half of s-plane?
   (b) What are the difficulties in RH stability crititerion? Explain, how you can over come them? [4+12]

5. (a) Explain how the type of a system determines the shape of polar plot
   (b) Write a note on Nyquist criterion for minimum phase & non minimum phase transfer functions. [8+8]

6. (a) Given $G(s) = \frac{42.77}{s(s+6.54)}$ If r(t) = 6.8 Sin 4t find the output at steady state.
   (b) Write a brief note on log-magnitude vs phase plots.
   (c) In Bode plots if gain cross over frequency is greater than phase cross over frequency then the system is UNSTABLE. Elaborate. [8+4+4]

7. (a) A control system is described by the differential equation $\frac{d^3y}{dt^3}(t) = u(t)$. Where y (t) is observed output and u(t) is the input.
      i. Describe the system in the state variable form $\dot{x} = Ax+Bu,\ \dot{y} = Cx+Du$.
      ii. Calculate the state transition matrix e^{At} of the system.
   (b) A linear system is described by the following transfer function $G(S) = \frac{S+1}{(S+2)^2(S+5)}$ Draw the state transition signal flow graphs using canonical form of decomposition. [10+6]

8. (a) Establish the relation relation between ξ and M_p for a step response of a second order system?
   (b) A system is given by differential equation $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+8y = 8x$, where y=output x= input. Determine all the time domain specifications and obtain output response for unit step input ? [3+13]

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Code No: R05220205 **R05** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE
Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain how the type of a system determines the shape of polar plot
   (b) Write a note on Nyquist criterion for minimum phase & non minimum phase transfer functions. [8+8]

2. (a) Find the transfer function for the following mechanical system: Shown in figure 3a

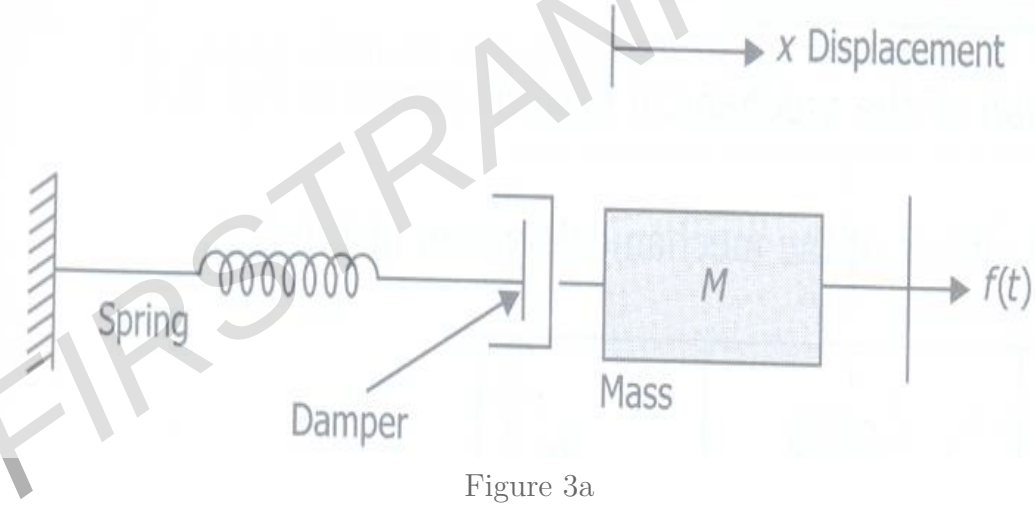

Figure 3a

   (b) Explain the limitations of closed loop system over open loop system. [10+6]

3. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 6a)

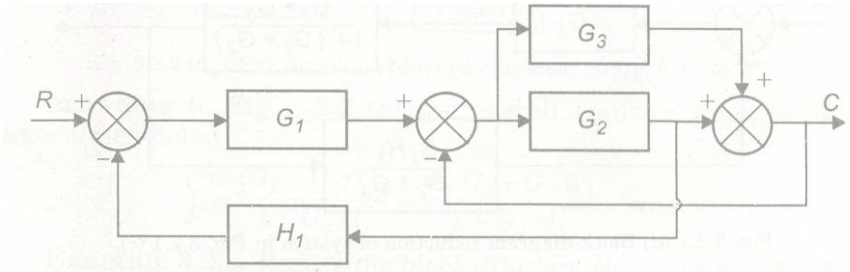

Figure 6a

   (b) Define various terms involved in signal flow graphs. [10+6]

4. (a) A control system is described by the differential equation $\frac{d^3y}{dt^3}(t) = u(t)$. Where y (t) is observed output and u(t) is the input.

i. Describe the system in the state variable form $\dot{x} = Ax+Bu,\ \dot{y} = Cx+Du$.

ii. Calculate the state transition matrix e^{At} of the system.

(b) A linear system is described by the following transfer function $G(S) = \frac{S+1}{(S+2)^2(S+5)}$ Draw the state transition signal flow graphs using canonical form of decomposition. [10+6]

5. (a) What are the necessary conditions to have all the roots of the characteristic Equation in the left half of s-plane?

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7. (a) Establish the relation relation between ξ and M_p for a step response of a second order system?

(b) A system is given by differential equation $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+8y = 8x$, where y=output x= input. Determine all the time domain specifications and obtain output response for unit step input ? [3+13]

8. (a) Given $G(s) = \frac{42.77}{s(s+6.54)}$ If r(t) = 6.8 Sin 4t find the output at steady state.

(b) Write a brief note on log-magnitude vs phase plots.

(c) In Bode plots if gain cross over frequency is greater than phase cross over frequency then the system is UNSTABLE. Elaborate. [8+4+4]

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Code No: R05220205 **R05** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
CONTROL SYSTEMS
Common to E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) What are the necessary conditions to have all the roots of the characteristic Equation in the left half of s-plane?
   (b) What are the difficulties in RH stability crititerion? Explain, how you can over come them? [4+12]
2. (a) Explain how the type of a system determines the shape of polar plot
   (b) Write a note on Nyquist criterion for minimum phase & non minimum phase transfer functions. [8+8]
3. (a) Find the transfer function for the following mechanical system: Shown in figure 3a

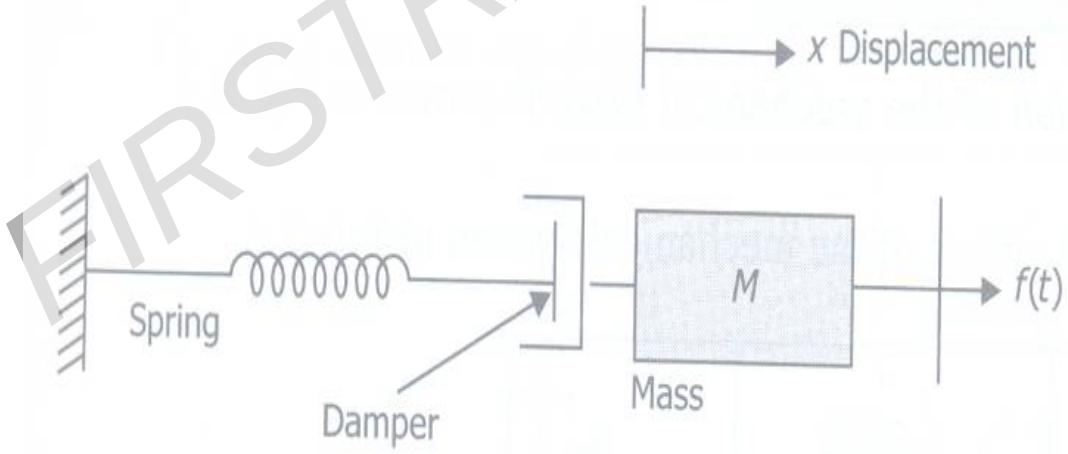

Figure 3a

   (b) Explain the limitations of closed loop system over open loop system. [10+6]
4. (a) Establish the relation relation between ξ and M_p for a step response of a second order system?
   (b) A system is given by differential equation $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+8y=8x$, where y=output x= input. Determine all the time domain specifications and obtain output response for unit step input ? [3+13]
5. (a) Given $G(s)=\frac{42.77}{s(s+6.54)}$ If r(t) = 6.8 Sin 4t find the output at steady state.
   (b) Write a brief note on log-magnitude vs phase plots.
   (c) In Bode plots if gain cross over frequency is greater than phase cross over frequency then the system is UNSTABLE. Elaborate. [8+4+4]

6. (a) Determine the transfer function $\frac{C(s)}{R(s)}$ for the following block diagram (figure 6a)

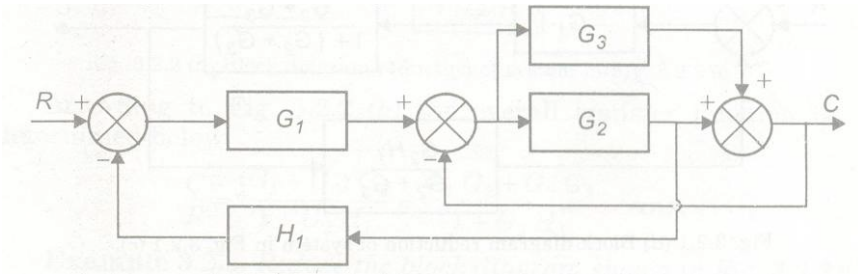

Figure 6a

(b) Define various terms involved in signal flow graphs. [10+6]

7. Design a phase lead compensator for unity feed back system whose open loop transfer function $\frac{K}{S(S+1)}$. The system has to satisfy the following specifications.

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