Code No: RR421302 **Set No. 1**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
COMPUTER AIDED DESIGN OF CONTROL SYSTEMS
(Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Determine the stability of the system described by

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \textit{ by using liapunov stability.}$$

[16]

2. Find a transformation of strict equivalence relating the two matrices
$\begin{pmatrix} S+1 & 2 & 0 \\ 1 & (S+2) & S+2 \\ -1 & -1 & 0 \end{pmatrix}$ *and* $\begin{pmatrix} 1 & 0 & 0 \\ 0 & S^2+3S & 2S+1 \\ 0 & 1 & 1 \end{pmatrix}$ [16]

3. Show that the poles of the closed − loop system are the zeros of the polynomial ϕ (s) [16]

4. Derive a generalized inverse Nyqnst criteria. [16]

5. Write short note on
   (a) Multi variable circle criteria.
   (b) sensitivity. [16]

6. Sketch the Gershgorin row bands for Q(s) = $\begin{bmatrix} \frac{s+4}{(s+1)(s+5)} & \frac{1}{s+5} \\ \frac{s+3}{(s+1)(2s+5)} & \frac{2}{2s+5} \end{bmatrix}$
   and investigate the closed loop stability. [16]

7. Explain in detail about any eight graphic commands in MATLAB. [16]

8. Write a MATLAB programs for the following:
   (a) to plot two steps response curves on one diagram take suitable transfer functions
   (b) To plot the root locus from state space
   (c) To plot the root locus for the transfer function G(s) = $\frac{10}{s(s+1)(s+2)}$ [16]

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Code No: RR421302 **Set No. 2**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
COMPUTER AIDED DESIGN OF CONTROL SYSTEMS
(Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Determine the stability of the system described by

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \textit{ by using liapunov stability.}$$

[16]

2. Prove two system matrices P(s) and P1(s) in state space form one system similar if and only if they are strictly system equivalent. [16]

3. (a) What are the measurable quantities using step response.
   (b) What are the measurable quantities using frequency response. [8+8]

4. (a) Compare the Inverse Nyquift method and Root locus methods.
   (b) Define sensitivity and explain the types of sensitivities in control system. [8+8]

5. What do you mean by a multivariable control system? Explain with suitable example?

[16]

6. Sketch the Gershgarin row bands for $\hat{Q(S)}$
   when Q(s) = $\begin{bmatrix} \frac{s+4}{(s+1)(s+5)} & \frac{1}{s+5} \\ \frac{s+3}{(s+1)(s+5)} & \frac{2}{s+5} \end{bmatrix}$
   and investigate the closed-loop stabililty. [16]

7. Find the current matrix I using MATLAB commands for the given network. (assume 3 loop Network and sources). [16]

8. Write a MATLAB program to determine for the following with example.
   (a) eigen values of A 3 x 3 matrix
   (b) bode plot of the transfer function
   (c) Roots of the characteristics equation
   (d) Step response of the T. F. [16]

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Code No: RR421302 **Set No. 3**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
COMPUTER AIDED DESIGN OF CONTROL SYSTEMS
(Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain Liapunov stability analysis. [16]
2. (a) Determine the transfer function from the state space.
   (b) Show that state model is not unique. [8+8]
3. Explain the stability of a SISO system using nyquist diagram. [16]
4. Illustrate the circle criteria for the inverse Nyquist plot. [16]
5. (a) What are ostrowsk's bands and how these are different from inverse nyquist plot.
   (b) Write short notes on grashgorin bands. [8+8]
6. Sketch the Gershgorin row bands for Q(s) = $\begin{bmatrix} \frac{s+4}{(s+1)(s+5)} & \frac{1}{s+5} \\ \frac{s+3}{(s+1)(2s+5)} & \frac{2}{2s+5} \end{bmatrix}$ and investigate the closed loop stability. [16]
7. Describe the following functions
   (a) zems
   (b) P2map
   (c) Group
   (d) Ackr [16]
8. Consider the system defined by
   X = Ax + Bu
   = Cx where A = $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -6 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $C = [1 \quad 0 \quad 0]$
   Design a full-order state observer, assuming that the desired poles for the observer are located at.
   S = -10, s = -10 , s = -15 [16]

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Code No: RR421302 **Set No. 4**

IV B.Tech II Semester Regular Examinations, Apr/May 2006
COMPUTER AIDED DESIGN OF CONTROL SYSTEMS
(Electronics & Control Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Determine the stability of the state, for the following system
$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ [16]

2. What are the different types of canonical forms in the state space and explain briefly. [16]

3. (a) In computer aided control system Design, what are the three modes of operation adopted by the designer
   (b) Explain phase lead composition through Root locus. [8+8]

4. (a) Examine the effect of a phase advance compensetor on a plant having g(s) = e^{-s}
   (b) How the oscillatory response can be improved. [8+8]

5. Write short note on
   (a) Multi variable circle criteria.
   (b) sensitivity. [16]

6. Is the matrix Q(s) = $\begin{bmatrix} 2-s & s+1 \\ s+3 & s+4 \end{bmatrix}$ dominant on a suitable large countour D and show that the corresponding system is open-loop unstable and cannot be stabilized by an f1> 0 and f2> 0. [16]

7. (a) Using MATLAB check the given number is prime number or not.
   (b) Perfect number or not. [8+8]

8. Write a MATLAB programs for the following:
   (a) to plot two steps response curves on one diagram take suitable transfer functions
   (b) To plot the root locus from state space
   (c) To plot the root locus for the transfer function G(s) = $\frac{10}{s(s+1)\ (s+2)}$ [16]

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