Code No: EE1931 **R14**

M. Tech II Semester Regular Examinations, September 2015
COMPUTER AIDED DESIGN OF CONTROL SYSTEMS
(Control Systems)

Time : 3 Hours **Max. Marks: 60**

Note: Answer Any Five Questions. All Questions carry equal marks.

1. a) Obtain Smith- Mc Millan form of following transfer function matrix.

$$G(s) = \begin{bmatrix} \frac{4}{(s+1)(s+2)} & \frac{-1}{s+1} \\ \frac{2}{s+1} & \frac{-1}{2(s+1)(s+2)} \end{bmatrix}$$ (6M)

   b) Give detailed procedure to obtain state space system matrix. (6M)

2. Consider the state space model given below. Check controllability and observability.

$$A = \begin{bmatrix} -3 & -2 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -5 \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \quad C = [1 \quad -1 \quad -1]$$ (12M)

3. Consider the system whose feed forward transfer function is given by $G(s) = 1/(s+1)^6$. Design a phase lead compensator using inverse nyquist diagram. (12M)

4. a) How can we investigate absolute and relative stabilities of system using nyquist criterion? Explain. (4M)

   b) Give detailed procedure to design phase lag compensator from nyquist diagram? (8M)

5. a) Give procedure to obtain bode and root loci plot for following system transfer function using MATLAB. $G(s) = \frac{(1-s)}{(1+s)^2}$ (7M)

   b) Write a short note on stability analysis using Matlab. (5M)

6. For a system with following state model and zero initial conditions, find steady state value of *y(t)* for a step input *u(t)*. $A = \begin{bmatrix} -5 & 1 \\ -3 & -1 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (12M)

7. a) How do you design state feedback controller using Matlab? (7M)

   b) Define circle criterion and explain in brief. (5M)

8. a) Explain Non Minimum Phase Response (NMP) of a system when step input is given. Also discuss NMP in internal stability point of view? (6M)

   b) Compare design of compensators using root locus and inverse nyquist diagram. (6M)

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