B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION APR/ MAY 2013
ELECTRICAL AND ELECTRONICS ENGINEERING
THIRD SEMESTER
EE 9201– CONTROL SYSTEMS
(REGULATION 2008)

Time : 3 hr **Max Mark: 100**

Answer ALL Questions
PART – A (10 x 2 = 20 Mark)

1. Consider a series RLC network. Determine the transfer function between the capacitor voltage and the supply voltage.
2. Represent the following differential equations by a suitable signal flow graph.
   $y'' + 3y' + 2y = u$
3. Comment on the number of possible root-locii for a second order system.
4. The position error constant of a system is infinite. What can be the Type of this system?
5. State the relationship between the damping ratio and the phase margin of a system.
6. Draw the polar plot of a system with G(s) = 1/[(s(s+1)].
7. State Nyquist' stability criterion for closed loop stability.
8. Define phase and gain margins
9. Represent the system defined by G(s)=1/[(s+1)(s+2)] in any one of the state variable forms
10. Define controllability

PART B (5 x 16 = 80 marks)

11. Consider a system whose open loop transfer function is given by $G(s) = K\dfrac{(s+1)}{s(s+10)(s+30)}$. Obtain the Bode plot and determine the phase and gain margin when K is 0.1, 1 and 10 respectively. Comment on your results.

12. (a)State and explain the Mason's gain formula. Also, determine the gain of the system described in figure 12.a. using Mason's gain formula.

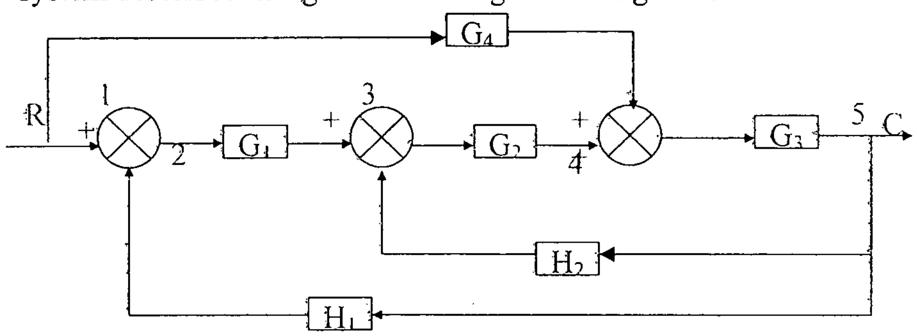

Figure 12(a)

(OR)

12 (b) State and Explain the Block diagram reduction rules. Determine the loop transfer function of the system shown in figure 12(a) using block diagram reduction.

13. (a) Consider a system whose closed loop transfer function is given by

$$G(s) = \frac{25}{(s^2 + 5s + 25)}$$. Determine the following (i) Resonant frequency, (ii)Resonant peak. (iii) DC gain. (iv) Bandwidth and (v) peak time and (vi) peak overshoot (16)

(OR)

13 (b)) Consider a system whose closed loop transfer function is given by

$$G(s) = \frac{K(s+5)}{s(s+1)(s+10)}$$

Draw the Root-locus plot and determine the gain K that results in critical damping under unity negative feedback.

14. (a) Obtain the Nyquist's contour of the system whose openloop transfer function is given by $G(s) = \frac{10}{s(s-1)(s+5)}$. Assess the closed loop stability of G(s) under unity negative feedback. (16)

(OR)

14. (b) Consider the system whose open loop transfer function is given by $G(s) = \frac{10}{s(s-1)(s+5)}$. Assess the stability of the closed loop system under unity negative feedback using Routh's Herwitz Criterion.

15. (a)Consider a system with $G(s) = \frac{1}{(s^2 + 5s + 1)(s + 5)}$. Obtain three state variable forms of the system. Show that infinite choices are possible for state variable representation.

(OR)

15.(b) Consider a system with

$$\dot{x} = \begin{bmatrix} -1 & 1 \\ 0 & -3 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

Determine the solution of state and output equation for a step input with initial state x0=[1;1]