25/10/13

9

Degree : **B.E Degree End Semester Examinations** **NOV/DEC 2013**
Branch : **ELECTRONICS AND COMMUNICATION ENGG**
Semester : **IV**
Code No. /Subject :**EC285/EC 9254 Control Systems (R-2004/2008)**
Answer ALL questions **PART-A** **(10X2=20 marks)**

1. List the advantages of closed loop system.
2. Obtain the transfer function of the network shown in fig.1

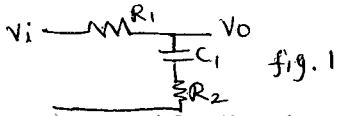

fig. 1

3. Define Peak overshoot and Settling time.
4. Sketch the outputs of critically damped and under damped second order system for unit step input.
5. What are the frequency domain specifications?
6. What are constant M and N circles?
7. State Routh Hurwitz stability criterion
8. What is the condition for stability of a closed loop system according to Nyquist stability criterion?
9. Define observability and provide the necessary conditions required for a system to be completely observable.
10. State sampling theorem.

PART-B **(5X16=80 marks)**

11. i. Find the steady state error of the system $G(s) = 50/(s+0.1)$, for the input $r(t) = 10+5t+6t^2$
    ii. Compare PI, PD and PID controllers.

12. a.i. Derive the transfer function for the mechanical system shown in figure 2.
    ii. For the block diagram shown in figure 3 , find the transfer function using block diagram reduction technique.

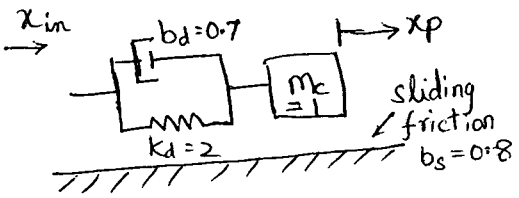

Figure 2

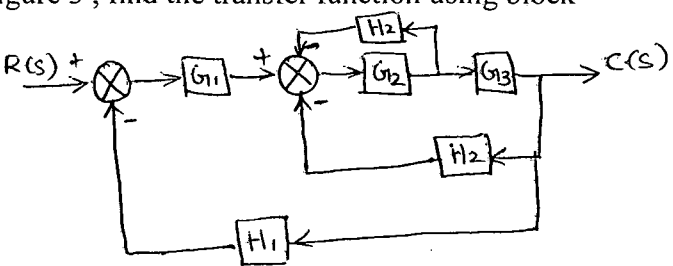

Figure 3

(or)

b. i. Find the transfer function of the circuit shown in figure 4
   ii. Find the transfer function of the block diagram shown in figure 5 using Mason's gain formula.

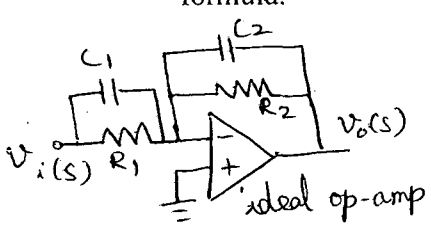

Figure 4

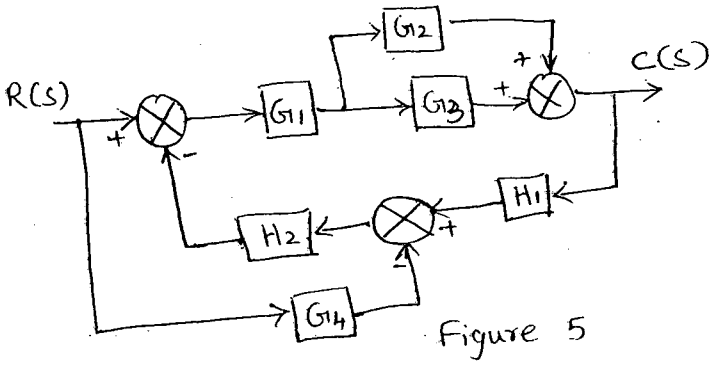

Figure 5

13. a. Find the value of K for the transfer function $G(s)H(s) = K/s(1+0.1s)(1+0.05s)$ such that gain margin is 20 dB and phase margin is 30° and draw Bode plot for the system

(or)

b. i. Find Gain Margin and Phase Margin for the system $G(s) = 10/s(s+0.1s)$ using Nichols chart.

ii. Briefly explain the effects and limitations of lag compensators.

14. a. i. The open loop transfer function of an unity feedback system is given by $G(s) = K/s(s+2)(s+6)$, find the range of K for which the system is stable, value of K which causes sustained oscillations and find the oscillating frequency.

ii. Indicate breakaway points and imaginary axis crossing points in the Root locus of the system described as $G(S)H(s) = 20K/s(s^2+20s+100)$ and find the value of K that results in unstable system.

(or)

b. Using Nyquist stability criterion, find the closed loop stability of the system $G(s)\,H(s) = K(s+1)/(s+0.5)(s-2)$ for K = 1.25 and K = 2.5.

15. a. For the RLC network shown in figure 6, write the state variable representation and check the system for complete controllability.

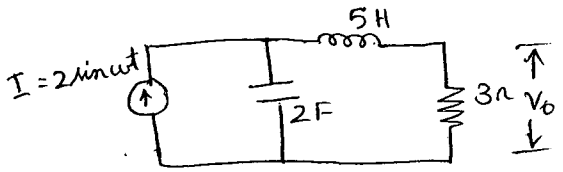

Figure 6

(OR)

b. i. Find the transfer function for the state variable representation of the system given below.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) \; ; \; y = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

ii. Write short notes on Sampled Data Systems