[4459] – 181

Seat No.	

T.E. Electronics and Telecommunication (Semester – I) Examination, 2013
CONTROL SYSTEMS
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. A) Explain the open loop and closed loop control systems with the help of suitable examples. **8**

   B) Reduce the block diagram given in Fig. 1 and find the transfer function $\frac{Y(s)}{R(s)}$. **8**

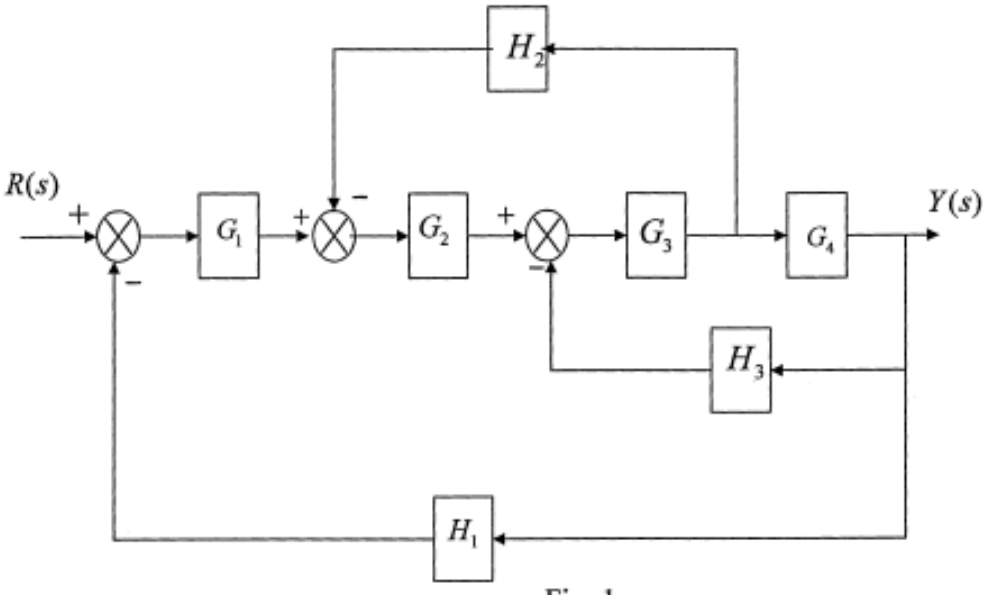


Fig. 1

OR

P.T.O.

2. A) Obtain the transfer function $\frac{Y(s)}{R(s)}$ of the signal flow graph given in Fig. 2 using Mason's gain formula. **8**

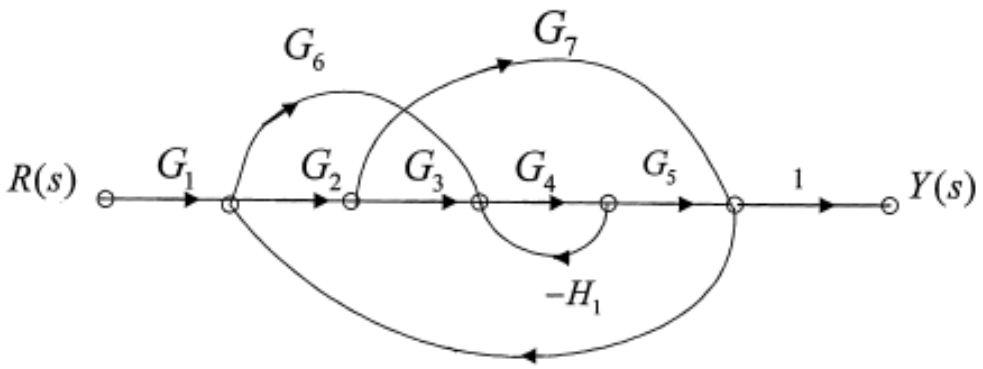


Fig. 2

B) Explain any eight rules of block diagram reduction technique. **8**

3. A) For the unity feedback system with open loop transfer function $G(s) = \frac{4(s^2 + 10s + 100)}{s(s+3)(s^2 + 2s + 10)}$ find the static error constants K_p, K_v, K_a and the steady state error for the step input. **8**

B) Determine the stability of sixth order system with the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16 = 0$. **8**

OR

4. A) Sketch the root locus of the unity feedback system with open loop transfer function $G(s)H(s) = \frac{k}{s(s+5)(s+10)}$. **12**

B) For the system with closed loop transfer function $G_{CL}(s) = \frac{100}{s^2 + 8s + 100}$. Determine the time domain specifications peak overshoot, rise time, peak time and settling time. **4**

5. A) Sketch the Bode plot of the unity feedback system with transfer function $G(s)H(s) = \frac{1}{s(s+1)(s+10)}$, find gain margin, phase margin, gain crossover frequency and phase crossover frequency and comment on the stability. **12**

   B) Explain the following frequency domain specifications : **6**
   1) Resonant peak
   2) Phase crossover frequency
   3) Gain margin.

OR

6. A) Sketch the Nyquist plot of the unity feedback system with transfer function $G(s) = \frac{40}{s(s+2)(s+10)}$ and comment on the stability. **12**

   B) Explain stability analysis using Bode plot. **6**

SECTION – II

7. A) Define terms
   i) State ii) State variables
   iii) State vector iv) State space. **4**

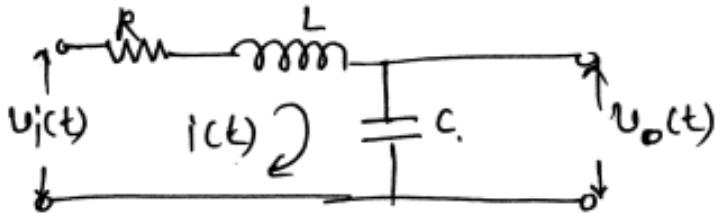
   B) What are the advantages of state space analysis over conventional control system analysis method ? **4**

   C) Obtain the state transition matrix of the system with system matrix
   $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$. **8**

OR

8. A) Consider a system having state model $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} u$ and $u = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$, with d = 0. Obtain its transfer function. **6**

B) Obtain state model of the given electrical network in the standard form Given at $t = t_0$, $i(t) = i(t_0)$ and $v_0(t) = v_0(t_0)$. **6**



C) List any four properties of state transition matrix. **4**

9. A) Explain the architecture of PLC with the help of neat block diagram. **8**

B) Explain in brief P, PI, PD and PID controllers. **8**

OR

10. A) Draw the PLC ladder diagram for the bottle filling plant process. **8**

B) Explain with suitable equations, the P, I, D, PI, PD and PID control actions. **8**

11. Write short notes on **any two** : **18**
    1) Model reference adaptive control
    2) SCADA
    3) DCS.

OR

12. A) Explain digital control system with the help of neat block diagram. **6**

B) Explain the concept of optimal control systems. **6**

C) Explain the concept of robust control systems. **6**

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