SE/Sem IV/CBSGS/ETRX/PCS/12-12-2017
&
RTC

Q.P. Code : 26077

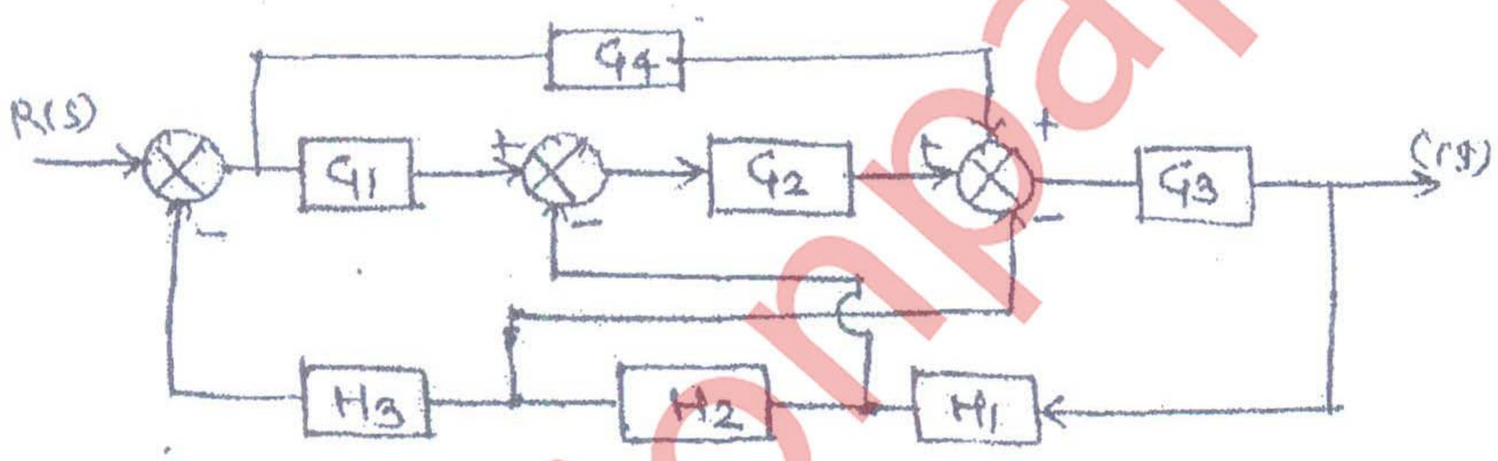
[Time: 3 Hours] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B:
1. Question No. 1 is compulsory.
2. Attempt any three questions from remaining.
3. Assume suitable data if required.
4. Figure to the right indicate full marks.

1. Attempt **any four** from the following: **20**
   a) Explain any five rules of root locus plot.
   b) What are the properties of state transition matrix.
   c) Explain adaptive control system.
   d) Describe the Mason's gain formula with an example.
   e) Explain need of compensators.

2. a) Obtain the overall transfer function from block diagram. **10**



   b) Find the solution of following state equation. **10**

$$\dot{x} = \begin{bmatrix} -5 & -6 \\ 1 & 0 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$$

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

3. a) Explain the type of signal which produces a finite steady state error for following system. Also find the steady state error. **10**

i) $G(s)H(s) = \dfrac{20}{(S+2)(S+3)}$

ii) $G(s)H(s) = \dfrac{20(S+1)}{S^2(S+2)(S+4)}$

iii) $G(s)H(s) = \dfrac{2.5(S^2+2S+1)}{S(S+1)(S^2+5S+2)}$

   b) Derive an Expression for output response of a second order under damped control system. Assume the input to be unit step signal. **10**

4. a) Draw the root locus for the system with $G(s)H(s)=\frac{K(S+2)(S+3)}{S(S+1)}$ and comment on stability. **10**

b) Determine the stability of the system having characteristic equation **10**
$S^5 + S^4 + 2S^3 + 3S + 5 = 0$

5. a) Draw Bode plot and find gain margin and phase margin for **10**
$$G(s)H(s)=\frac{64(S+2)}{S(S+0.5)(S^2+3.2S+64)}$$

b) Discuss the stability of system using Nyquist plot for $G(s)H(s)=\frac{20}{S(S+4)(S-2)}$. **10**

6. Attempt **any two** **20**

a) Different composite controllers.

b) Co-relation between time domain and frequency domain specification.

c) Using Mason's gain formula, find the gain of the following system in figure below.