

8

Q.P. Code :27290

[Time: Three Hours]

[Marks:80]

Please check whether you have got the right question paper.

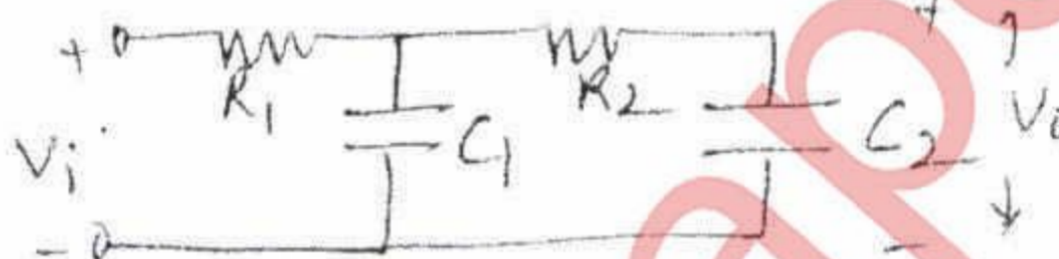
- N.B:
1. Question.No.1 is compulsory.
 2. Attempt any three questions from the rest.
 3. Assume suitable data wherever necessary.
 4. Use graph paper and semi log paper wherever required.

Q. 1 Answer any four.

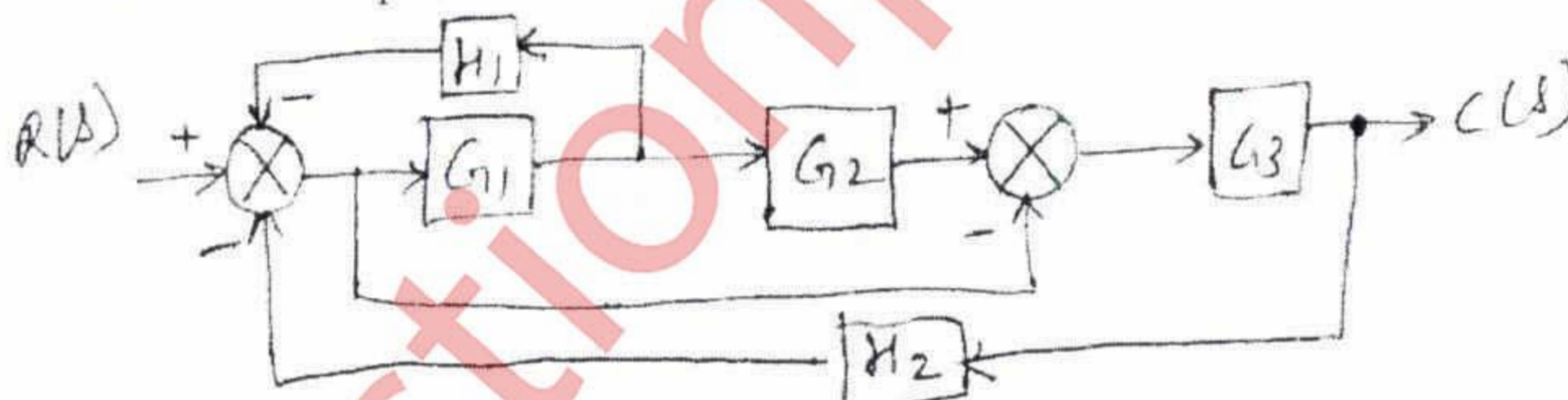
(20)

- a) Explain with suitable diagram, the different elements of a closed loop control system.
- b) Explain what you mean by type of the system and its relation with steady state error.
- c) Explain Routh Hurwitz criteria of stability.
- d) What is Nyquist stability criteria?
- e) Explain the phase variable form of state-space modelling.

Q. 2 a) Obtain the transfer function of the following network.

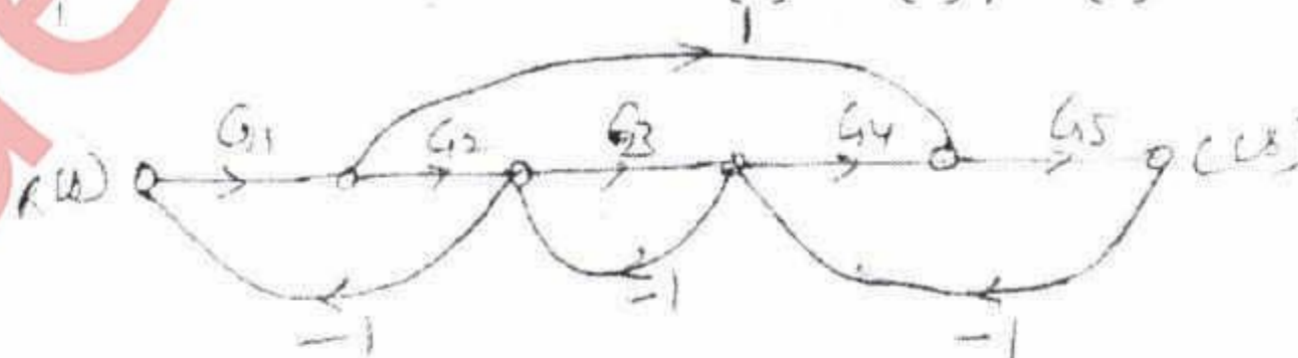


b) Find the closed loop transfer function $T(s) = c(s) / R(s)$ for the system shown using block diagram reduction technique.



Q. 3 a) Using Messon's Rule find the transfer function $T(s) = C(s) / R(s)$ for the system.

(10)



b) Given the unity feedback system with

(10)

$$G(s) = \frac{K}{s(s+a)}$$

Find the following

- i) K and a to have $K_v = 1000$ and 20% overshoot.
- ii) K and a to have a 1% error in the steady state and a 10% overshoot.

- Q. 4 a) Using Hurwitz stability criteria, find the value of gain K to ensure stability in the unity feedback system with open loop transfer function (10)

$$G(s) = \frac{K(s+2)}{(s^2+1)(s+4)(s-1)}$$

- b) Given the unity feedback system with open loop transfer function $G(s) = \frac{K}{(s+2)(s+4)(s+6)}$ sketch the root locus. (10)

- Q. 5 a) Given the following response function, determine whether the pole-zero cancellation is possible. If it is then find the percent overshoot, settling time rise time and peak time. (10)

$$C(s) = \frac{s+2.1}{s(s+2)(s^2+s+5)}$$

- b) Plot the Bode magnitude and phase plot and obtain the phase margin and gain margin (10)

$$G(s) = \frac{(s+5)}{(s+2)(s+4)}$$

- Q. 6 a) Given the transfer function (10)

$$G(s) = \frac{2}{s^3+4s^2+9s+10} \text{ obtain the phase variable form of state space representation.}$$

- b) Given the state model of a system. Find the transfer function. (10)

$$\dot{X} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & -6 & -9 \end{bmatrix} X + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} 4$$

$$Y = [1 \ 0 \ 0] X$$

State whether the system is controllable.
