Q.P. Code :27290

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

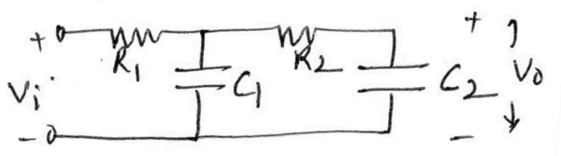
Please check whether you have got the right question paper.

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.

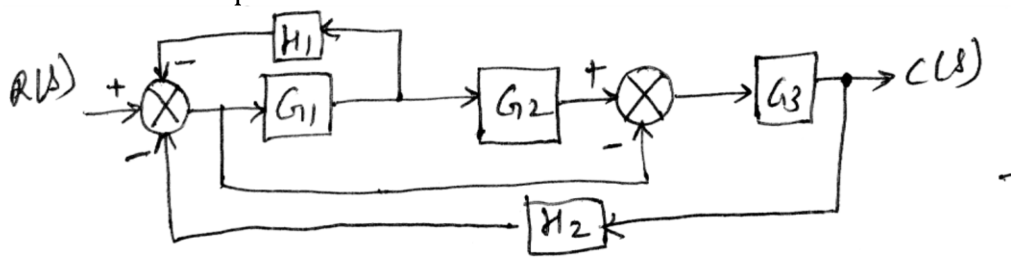
Q. 1 Answer **any four**. (20)

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 Hurwitze criteria of stability.
d) What is Nyquist stability criteria?
e) Explain the phase variable form of state-space modelling.

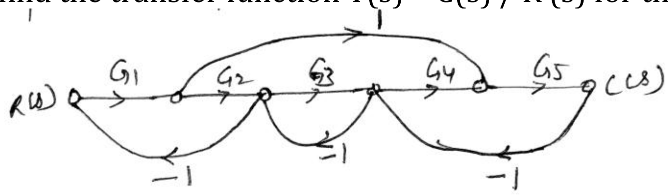
Q. 2 a) Obtain the transfer function of the following network.



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 Mession'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 Kv = 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 Hurwitze 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, setting 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) = $\frac{2}{s^3+4s^2+9s+10}$ obtain the phase variable form of state space representation.

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

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

Y= [1 0 0] X

State weather the system is controllable.

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