

- vi) The order of the system is determined by
- number of poles in the transfer function
 - number of zeros in the transfer function
 - difference in number of poles and zeros in the transfer function
 - the highest degree of S of the characteristic polynomial.
- vii) The initial slope of the Bode plot for a transfer function having a simple zero at origin is
- 20 dB/decade
 - 10 dB/decade
 - 20 dB/decade
 - 10 dB/decade.
- viii) In terms of Bode plot, the system is stable if
- both gain margin and phase margin are positive
 - both gain margin and phase margin are negative
 - gain margin is positive and phase margin is negative
 - gain margin is negative and phase margin is positive.
- ix) The value of ξ for some system is unity. The system response will be
- overdamped
 - critically damped
 - underdamped
 - oscillatory.
- x) Transfer function is defined for
- non-linear time invariant system
 - non-linear time variant system
 - linear and time invariant system
 - linear and time variant system.
- xi) The number of root loci for a unity feedback system having open loop transfer function with finite n number of poles and finite m number of roots is
- $m - n$
 - $n - m$
 - m
 - n .
- xii) In case of critical damping, the damping ratio is
- less than 0
 - 1
 - less than 1
 - greater than 1.



GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

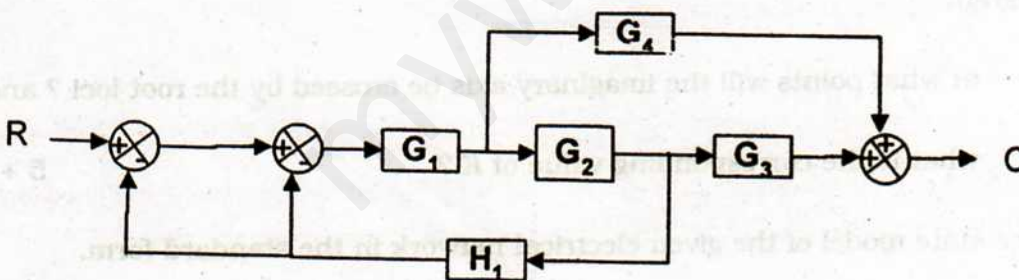
3 × 5 = 15

2. The open loop transfer function of a unity negative feedback system is given below :

$$G(s) = \frac{500}{S(S+15)}$$

Find

- the transient response for a unit step input
 - the value of rise time and peak time. 5
3. Determine the stability of system whose characteristic equation is given by
- $$s^5 + 2s^4 + 3s^3 + 6s^2 + 5s + 3 = 0. \quad 5$$
- Define error coefficients corresponding to step and ramp inputs. 3
 - A unity feedback closed loop second order system has a transfer function $\frac{81}{s^2 + 0.6s + 9}$ and it is excited by a step input of 10 units. Find out its steady state error. 2
5. Use Block Diagram Reduction technique to find out the overall transfer function of the following system : 5



6. A linear system with single input and output is described by

$$\frac{d^3 c(t)}{dt^3} + \frac{d^2 c(t)}{dt^2} + \frac{4 dc(t)}{dt} + c(t) = 5 u(t).$$

Write the state equations in matrix form.

5



GROUP - C

(Long Answer Type Questions)

Answer any three questions.

3 × 15 = 45

7. Construct the Bode plots for a unity feedback system whose open loop transfer function is given by $G(s) = \frac{10}{s(1+s)(1+0.2s)}$.

From the Bode plot determine

- gain and phase cross-over frequency
- gain and phase margin
- stability of the closed loop system. 15

8. a) Using Routh criterion investigate the stability of a unity feedback control system whose transfer function is given by $G(s) = \frac{e^{-sT}}{s(s+2)}$. 6

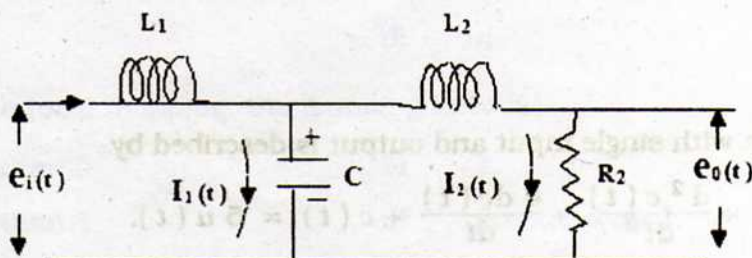
- b) Consider the open loop transfer function of a unity feedback system

$$G(S) = \frac{K(S+3)}{S(S^2+2S+2)(S+5)(S+6)}$$

Draw the root locus diagram of the system on a graph paper and indicate on that diagram

- at what points will the imaginary axis be crossed by the root loci? and
- what is the corresponding value of K ? 5 + 3 + 1

9. Obtain the state model of the given electrical network in the standard form. 15





10. a) Find the Z transform of

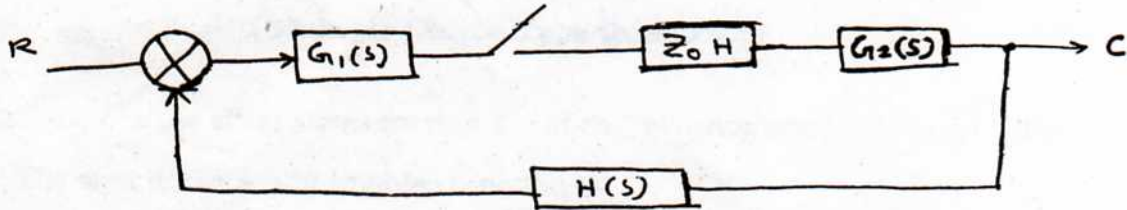
i) $f(k) = ke^{-3k}$

ii) $f(k) = k^2$.

8

b) Find $\frac{C(Z)}{R(Z)}$ for the following sampled data closed system shown in figure below.

7



11. a) State Nyquist Stability Criterion.

5

b) Using Nyquist Stability Criterion determine whether the unity feedback close loop system having open loop transfer function,

$$G(s)H(s) = 120/S(S+4)(S+6),$$

is stable or not ?

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