G 1089 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Applied Electronics and Instrumentation Engineering

CONTROL SYSTEM THEORY (A)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Write mason's gain formula. Explain the significance of this formula.
2. State the initial and final value theorems of Laplace transform.
3. Write time response of first and second order systems.
4. Define : damping ratio.
5. Concept of stability.
6. Write the advantages and applications of bode plots.
7. Define : gain margin and phase margin.
8. Write Nyquist stability criterion.
9. What is the need for compensator ?
10. Write short note on stability of closed loop discrete system.

(10 × 4 = 40 marks)

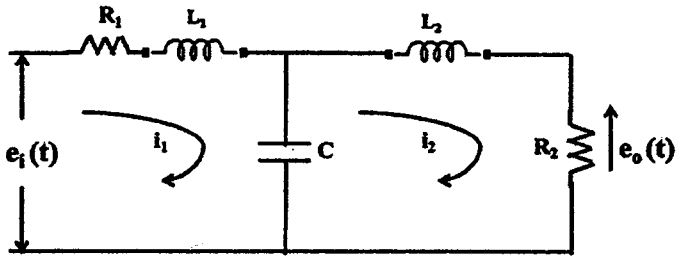
Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Derive mason's gain formula. Explain the applications of this formula with an example.

Or

12. Find the transfer functions of the network shown in Figure.



13. Discuss the unit step response of second order system.

Or

14. For a system with, $GH(S)=\frac{5}{s+5}$, calculate the generalized error coefficients and the steady state error. Assume $r(t)=6+5t$.

15. A unity feedback control system has an open-loop transfer function

$$G(S)=\frac{K}{S(S^2+4S+13)}$$

Sketch the root locus plot of the system.

Or

16. Consider the open-loop trasnfer function of a unity feedback control system.

$$G(S)=\frac{K(S+2)}{S(S+4)(S+6)}$$

Using Routh criterion, find the range of values of K that corresponds to a stable system. Note that K is a positive real constant.

17. Explain the general procedure for constructing Nyquist plots.

Or

18. By use of Nyquist criterion, determine whether the closed-loop systems having the following open-loop transfer functions are stable or not. If not, how many closed-loop poles lie in the right half S-plane.

$$G(S)H(S)=\frac{1}{S(1+2S)(1+S)}$$

19. The open-loop transfer function of a system is given by :

$$G(S)=\frac{K}{S(S+1)(S+4)}$$

Design a suitable lag compensator to meet the following specifications. Phase margin = 43°, Bandwidth = 1.02 rad/sec, Velocity error constant, $K_v \geq 5\ \text{sec}^{-1}$.

Or

20. Explain in detail about the stability of closed-loop discrete system.

(5 × 12 = 60 marks)