EEL301 - Control Engineering - I

Major Test

Max. Score : 50 Time : 2 hrs

1. Consider the system (7)

$$G(s) = \frac{100}{(s+1)(s/3+1)(s/100+1)}$$

Draw the approximate Bode plot for the system and determine the stability margins.

2. For the system in Q.1, design a compensator such that the following specifications are met by the closed loop system. (12)

   - The steady state error for a unit step reference should be less than 1%.
   - The Phase margin of the system should be atleast 30 degrees.

3. Consider the system (10)

$$G(s) = \frac{1}{s(s^2 + 2\zeta\omega_n s + \omega_n^2)}$$

Draw the polar plot for the system and determine the conditions for closed loop stability of the system using Nyquist criterion.

4. For the system (10)

$$G(s) = \frac{1000}{s^2 + 20s + 100}$$

Design a controllcr using P, I and D elements to achieve a phase margin of 30 degrees.

5. Define (a) Rise time, (b) Settling time, (c) Bandwidth, (d) Resonant frequency. (8)

6. Consider a snake moving on land. What determines the order of the differential equation defining its posture and motion. (3)