Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Fifth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

EEE109: Control Engineering

(Semilog sheet, ordinary graph sheet and polar graph sheet are required)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

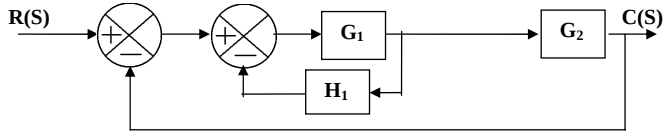
1. Signal flow graph is used to find
   a) stability of the system b) Controllability of the system
   c) Transfer function of the system d) Observability of the system
2. Synchros used as a
   a) Encoder b) Decoder
   c) error detector d) Speed detector
3. Acceleration error constant of type 1 order 1 system is
   a) One b) Zero
   c) Infinite d) Constant
4. The PID controller in a system improves
   a) Steady state response b) Transient response
   c) No response d) Both (a) and (b)
5. The magnitude at cutoff frequency is called
   a) gain margin b) Phase margin
   c) gain cross over frequency d) cutoff rate
6. _____is the graph between Magnitude in decibel and phase angle in degrees.
   a) bode plot b) polar plot
   c) Nichol's chart d) Magnitude plot
7. Relative stability of system with low settling time is ____ ,system with high settling time.
   a) Less than b) Lesser than
   c) Equally stable compared to d) All of the above
8. If a nyquist plot cuts the negative real axis at a distance of 0.4,than the gain margin of the system is
   a) 0.4 b) 4%
   c) 2.5 d) -0.4
9. The value of β (Beta) in lag compensator is _____ .
   a) Less than one b) Greater than one
   c) Equal to one d) Equal to zero
10. A property of phase lead compensation is to
    a) Increase Overshoot b) reduce Bandwidth of closed loop system
    c) reduce Rise time of closed loop system d) Reduce Gain margin

PART B (10 x 2 = 20 Marks)

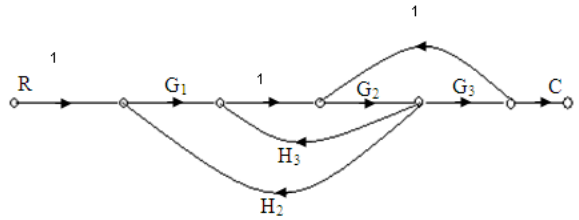
11. Write some examples for closed loop system.
12. Derive the transfer function of single closed loop with negative feedback.
13. Define rise time for a second order under damped system.
14. How the systems are classified depending on the value of damping?
15. Define bandwidth and also write the effect of high bandwidth.
16. What are the advantages of finding stability using Nichol's chart?
17. How to determine the stability of the system based on location of closed loop poles?
18. What are all the effects of addition of poles to the given system?
19. Write the transfer function of lead lag network.
20. What is lead lag compensator?

PART C (5 x 14 = 70 Marks)

21. a) (i) Find the overall transfer function of the system (4)



(ii) Find the overall transfer function of the given system using Mason's gain formula. (10)



(OR)

b) (i) Derive the transfer function of Armature controlled DC servo motor. 8

(ii) Explain the operation of potentiometer. 6

22. a) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$. Find its rise time, peak time, peak overshoot and settling time if subjected to unit step input. Also derive expression for its output response. 8+6

(OR)

b) The open loop transfer function of a unity feedback control system is

$$G(S) = \frac{50}{S\,(1+0.1S)}$$

Find the steady state error using both the error coefficient methods for $r(t) = 1+2t+t^2$.

23. a) Draw the bode plot of the system

$$G(S) = \frac{10}{S\,(1+S)\,(1+0.1S)}$$

.Find the gain margin and phase Margin.

(OR)

b) Draw the polar plot for

$$G(S) = \frac{I}{S\,(1+0.5S)\,(1+2S)}$$

Find the gain margin and phase margin.

24. a) (i) Using Routh-Hurwitz criterion find relation between K and T so that unity feedback control system whose open loop transfer function given below is stable. (8)

$$G(S) = \frac{K}{S\,\{S\,(S+10)+T\}}$$

(ii) Write the procedure to draw Nyquist plot. (6)

(OR)

b) A unity feedback control system has an open loop transfer function $G(S) = K / \{s\,(s^2 + 4s + 13)\}$ Sketch the root locus.

25. a) (i) Derive the transfer function of Lead network. (7)

(ii) Discuss about implementation of compensator using operational Amplifier. (7)

(OR)

b) A unity feedback system has an open loop TF

$$G(S) = \frac{1}{S(S+1)(0.5S+1)}$$

Design a suitable Lead compensator to achieve Kv=5, Phase margin is at least 40 deg.

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