

Register Number:.....

**B.E., DEGREE EXAMINATIONS MAY/JUNE 2013**

Fifth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

EEE109: Control Engineering

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL Questions:-**

**PART A (10x1=10 Marks)**

1. ----- is an example for open loop control system.  
a) the electric switch      b) traffic signal      c) liquid level control system      d) All the above.
2. The Inductance, in force- current analogy is analogous to  
a) Momentum                      b) velocity                      c) displacement                      d) mass
3. Steady state acceleration error of type 0 is  
a) Zero                      b) unity                      c) infinity                      d) none
4. The time required for the response to reach half of the final value for the first time is  
a) decay time              b) rise time                      c) delay time                      d) pick up time
5. In Routh Hurwitz criteria, if there are changes in signs in the elements of the first column, then the number of sign changes indicates  
a) The number of roots with negative real parts  
b) The number of roots with positive real parts  
c) None of the above  
d) Both positive and negative real parts.
6. Which of the following method is the best method for calculating the stability and transient Response  
a) root locus                      b) bode plot                      c) M& N circles                      d) All the above
7. The Nicholas chart is quite useful for determining  
a) closed loop frequency response from open loop  
b) open loop frequency response from closed loop

c) both open loop and closed loop

8. Which plot is drawn in time domain?

- a) Nyquist plot    b) bode plot    c) Root locus    d) Nicholas plot

9. The lead compensator network improves

- a) steady state response    b) transient response  
c) steady state and transient response    d) none of the above

10. ----- network acts as a low pass filter

- a) lag    b) lag lead    c) lead    d) lead lag

**PART B (2 x 10 = 20 Marks)**

11. Define transfer function

12. How will you calculate the overall transfer function when several blocks are connected in cascade?

13. Define type and order of a system.

14. Give the relation between static and dynamic error co-efficient.

15. What is Routh- stability criterion?

16. List out some frequency domain specifications.

17. What are the advantages of M&N Circles?

18. How do you find Gain margin from bode plot?

19. What are the merits of lag-lead compensator?

20. What are Compensators?

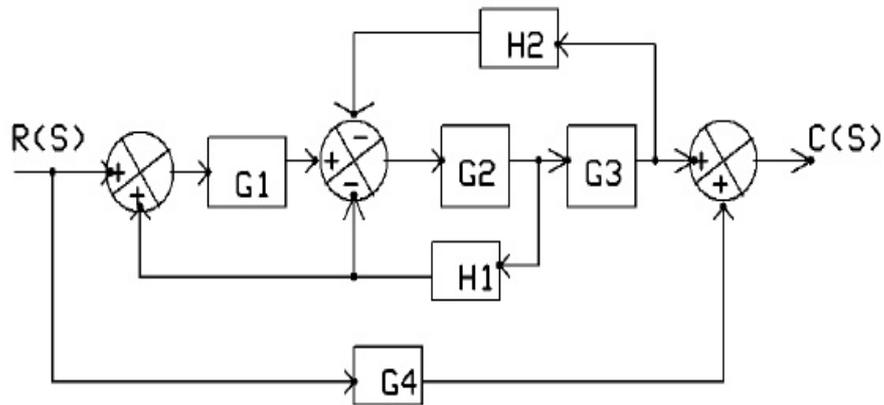
**PART C (5x14 = 70 Marks)**

21. a) (i) Derive transfer function of a D.C servo motor. (8)

(ii) Write short notes on Synchronos. (6)

**(OR)**

b) Determine the transfer function of the given system, using block diagram reduction technique. Convert the above in to signal flow graph and verify the transfer function.



22. a) (i) Derive the unit step response of a second order system when damping ratio is less than unity and it is equal to unity.

(OR)

b) (i) For a unity feedback system with over all transfer function  $G(s) = \frac{1}{S(S+3)}$ .

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$S(S+3)$ .

Calculate the Following 1) damping factor 2) undamped natural frequency

3) Damping frequency 4) Peak time 5) Maximum overshoot 6) rise time.

23. a) (i) Sketch the polar plot for the system with open loop transfer function is given by (14)

$$G(s)H(s) = \frac{10(S+2)(S+4)}{S^2-3s+10}$$

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$$S^2-3s+10$$

(OR)

b) Sketch the bode plot for the system with open loop transfer function is given by (14)

$$G(s) = \frac{0.75 (1+0.2 S)}{S(1+0.5 S)(1+0.1 S)}$$

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$$S(1+0.5 S)(1+0.1 S)$$

calculate Gain Margin and phase margin

24. a) Using Routh stability criteria check the stability of a given system and comment on it.

(i)  $S^5 + S^4 + 2S^3 + 2S^2 + 3S + 15 = 0$

(II) Find the range of values of K ,  $F(s) = S (S^2 + S + 1)( S+4) + K = 0$

**(OR)**

b).Sketch the root locus for the system and comment on stability

$$G(s)H(s) = \frac{K(S+4)(S+5)}{(S+3)(S+1)}, \quad K > 0$$

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$$(S+3)(S+1), \quad K > 0$$

25. a) Draw the circuit of lag- lead compensator and derive the transfer function .What are the effects of the above compensator.

**(OR)**

b) Consider the following open loop transfer function

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

Design a lag compensator to satisfy the following specifications Damping ratio = 0.5

2) settling time = 10 sec 3) velocity error constant  $K_v > 5$  sec

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