KUMARAGURU
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Register Number:……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Fourth Semester

EEE111: CONTROL SYSTEMS

(Common to EIE/AE)

(Semi log 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. Transfer function is found using
   a) Block diagram reduction technique b) Signal flow graph method
   c) Frequency response method d) Both (a) and (b)
2. DC servo motor is constructed with permanent magnet due to
   a) Higher torque /inertia ratio b) Higher operating efficiency
   c) No field losses d) All of the above
3. Velocity error constant is zero for
   a) type 0 system b) type 2 system
   c) type 1 system d) type 3system
4. The steady state response and transient response improved by
   a) P controller b) PI controller
   c) PD controller d) PID controller
5. The closed loop system stability is calculated using
   a) Bode plot b) Polar plot
   c) Nichols chart d) Both (a) and (b)
6. The frequency at which two asymtodes meet is called
   a) Cutoff frequency b) Corner frequency
   c) Damped frequency d) Natural frequency
7. As a root moves further away from imaginary axis ,the relative stability of the system
   a) have no change b) Reduces
   c) improves d) Both (a) and (b)

8. The closed loop system is stable if the number of anti clockwise encirclement of 1+G(S) H(S) plane around the origin is_____ number of right half s-plane poles of open loop transfer function.

a) Less than b) Greater than

c) Equal to d) Independent of

9. In lag-lead network, phase lag occurs in _____ frequency region and phase lead occurs in ____ frequency region.

a) High, low b) Low, high

c) High, high d) Low, low

10. Lag compensator approximately acts as a

a) PI controller b) PD controller

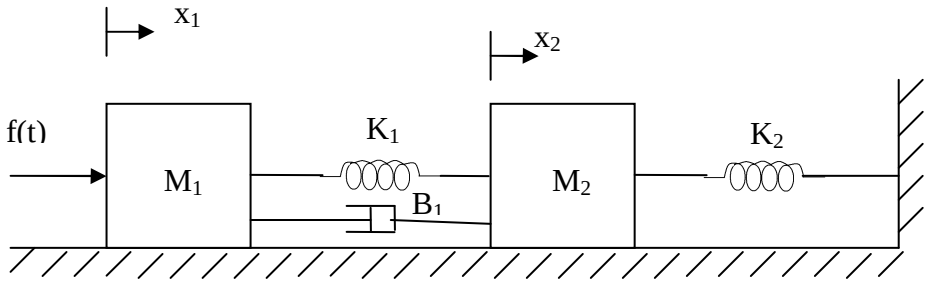
c) P controller d) PID controller

PART B (10 x 2 = 20 Marks)

11. Compare open loop system and closed loop system.
12. State the advantages and disadvantages of Block diagram reduction method.
13. Enumerate the advantages of generalized error coefficients.
14. What are the effects of PI controllers?
15. List all the specifications of frequency response.
16. What are constant M circles?
17. State marginally stable system.
18. What all are the effects of addition of poles to the given system?
19. What is the maximum lead angle attained for single lead network? Why?
20. What are the effects of lead-lag compensator?

PART C (5 x 14 = 70 Marks)

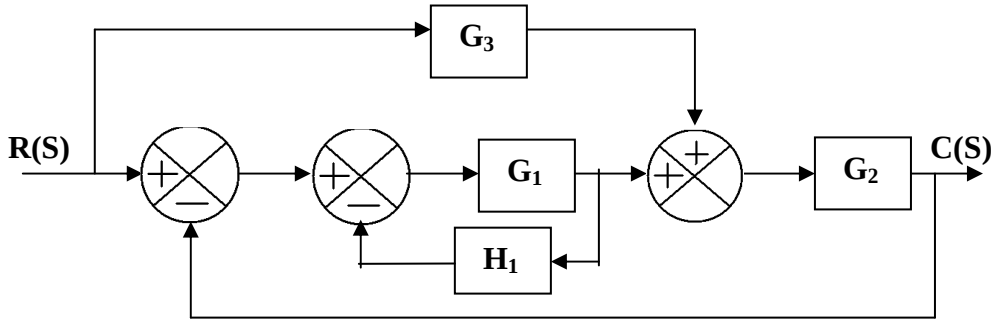
21. a) (i) Draw the voltage and current analogy for the following mechanical system. (7)



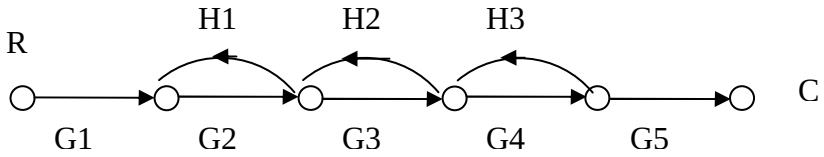
(ii) Estimate the mathematical model of field controlled DC motor. Hence deduce the transfer function of the motor. (7)

(OR)

b) (i) Evaluate the Transfer function using block diagram reduction technique. (7)



(ii) (7)



Find C(S)/R(S) using Mason's gain formulae.

22. a) Measurements are conducted on a servomechanism show the system response to be $c(t) = 1+0.2e^{-60t}-1.2e^{-10t}$ when subjected to a unit step input (i)Obtain the expression for the closed loop transfer function.

(ii) Determine the undamped natural frequency (iii) damping ratio and

iv) damped natural frequency.

(OR)

b) Determine the generalized error coefficient and steady state error for a system whose open loop transfer function is G(S) = 10 / { s (0.1s+1)) }and the feedback is unity,r(t) = 1 + 6t.

23. a) Draw the bode plot of the system

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

Find the gain margin and phase Margin.

(OR)

b) Draw the polar plot of the system

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

. Find the gain margin and phase margin.And also find the value of K for phase margin =20°.

24. a) (i) The open loop transfer function of a unity feedback control system given by (8)

$$G(S) = \frac{K}{S\,(ST_1+1)\,(ST_2+1)}$$

Applying Routh –Hurwitz criterin determine the value of K in terms of T1 and T_2 for the system to be stable.

(ii) Write the procedure to find stability of the system using Nyquist criterion. (6)

(OR)

b) The loop transfer function of a feedback control system is given by

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

Sketch the root locus plot with K as a variable parameter.

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

(ii) Write the procedure to design the lag compensator using bode plot. (7)

(OR)

b) A unity feedback system has an open loop TF

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

Design a suitable Lead compensator to achieve Kv=10, Phase margin > 45 degree with usual notations.

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