KUMARAGURU
college of technology
character is life

Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Sixth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

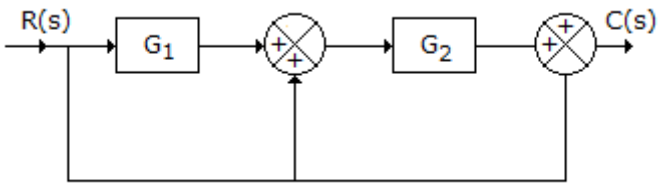
ECE117**:** Control Systems Engineering

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. For the given system,the transfer function is



a) $G_1 + G_2 + 1$ b) $G_1 G_2 + 1$

c) $G_1 G_2 + G_2 + 1$ d) $G_1 G_2 + G_1 + 1$

2. Whether a linear system is stable or unstable that it

a) is a property of the system only b) depends on the input function only

c) both (a) and (b) d) either (a) or (b)

3. For the feedback system with closed loop transfer function $\frac{C(s)}{R(s)} = \frac{\omega^2_n}{s^2 + 2\xi\omega_n s + \omega^2_n}$ the settling time for 2% tolerance

a) $\frac{2}{\xi\omega_n}$ b) $\frac{\xi\omega_n}{2}$

c) $\frac{4}{\xi\omega_n}$ d) $4\xi\omega_n$

4. In a second order system with a unit step input, the speed of response is high if system is

a) Over damped b) Un damped system

c) critically damped d) Underdamped

5. If the polar plot, as the frequency is varied from 0 to infinity is

a) a semicircle
b) a circle
c) a straight line
d) a parabola

6. In Bode diagram (log magnitude plot) the factor $(j\omega)^n$ in the transfer function gives a line having slope

a) 20 dB/decade
b) 20n dB/decade
c) $\frac{20}{n}$ db/decade
d) -20n dB/decade

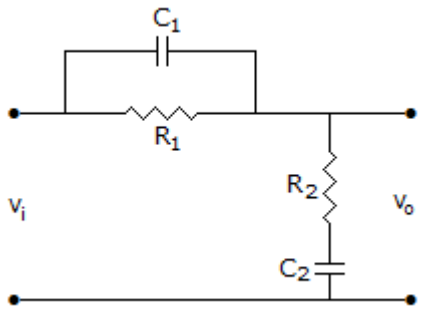
7. The entries in the first column of Routh array of a fourth order are 5, 2, - 0.1, 2, 1. The number of poles in the right half plane are

a) 1
b) 2
c) 3
d) 4

8. If Nyquist plot has a encirclement of (-1 + j0) point, the system is stable if

a) there are no poles of G(*s*) H(*s*) in right-half plane
b) there is one pole of G(*s*) H(*s*) in right-half plane
c) there is no zeros of G(s) H(s) in right-half plane
d) there is one zero of G(s) H(s) in right-half plane

9. The compensator in the given figure is a



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

10. The primary function of lag compensator is to provide sufficient

a) gain margin
b) phase margin
c) both gain margin and phase margin
d) either (a) or (b)

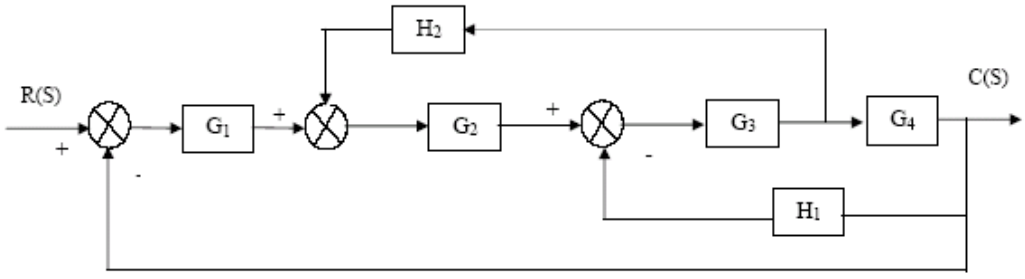
PART B (10 x 2 = 20 Marks)

11. What is a closed loop system?
12. What does a block diagram represent?
13. What is an Impulse signal?

14. Give the relation between the generalized and static error coefficients.
15. What are the frequency domain specifications?
16. What is a minimum phase system?
17. What is BIBO stability?
18. What does a row full of zeroes in a Routh's array indicate?
19. When lag, lead, lag/lead compensators employed?
20. Write the transfer function of lead compensator and draw its pole-zero Plot.

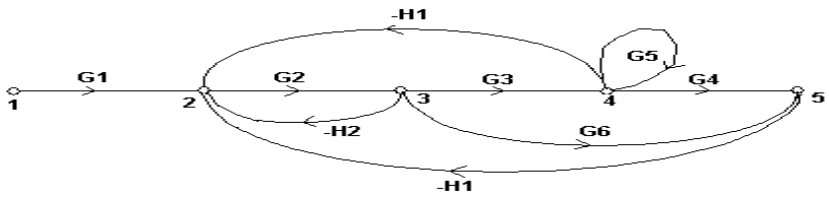
PART C (5 x 14 = 70 Marks)

21. a) Find the transfer function of the given model using block diagram reduction technique.



(OR)

b) Obtain the closed loop transfer function Y(s)/R(s) using Mason's gain formula.



22. a) Derive the expression for response of under-damped second order system subjected to unit step function.

(OR)

b) For a closed loop system whose G(s) = 10/s(s+1)(s+2) find the steady state error when subjected to the input $r(t) = 1+2t+ (3/2) t^2$

23. a) Sketch the Bode plots for the given transfer function and obtain the phase and gain crossover frequencies.

G(s) = 10 /{ s(1+0.4s) (1+0.1s)}

(OR)

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

G(s) = 1 /{s (1+s) (1+2s)}.sketch the polar plot and determine the gain margin and phase margin

24. a) Construct the Routh's array and determine the stability of the system represented by the characteristic equation $s^5+s^4+2s^3+2s^2+3s+5=0$ .Comment on the location of roots of the characteristic equation.

(OR)

b) Sketch the root locus of the system whose open loop transfer function is

G(s) = K/s(s+2) (s+4).

25. a) Write down the step by step procedure to design a lead compensator for obtaining stability.

(OR)

b) The open loop transfer function of a unity feedback control system is given by G(s) = K/s(s+4) (s+80).It is desired to have the phase margin to be at least 33° and the velocity error constant K_v = 30 sec^{-1}.Design a phase lag series compensator.

****