B.E DEGREE EXAMINATIONS: APRIL/MAY 2012

Fourth Semester

EEE111: CONTROL SYSTEMS

(Common to Electronics and Instrumentation Engineering & Aeronautical Engineering)

(Provide semi log sheet, polar graph and ordinary graph sheets)

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

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. _____ series gives error signal as a function of time.

    a) Steady state error   b) Static error   c) Dynamic error   d) Generalized error

2. The response of the system as t→∞ is called _____.

    a) Steady state response   b) Transient response

    c) Oscillatory response   d) parabolic response

3. The disadvantages of proportional controller are that it produces a _____.

    a) Peak value   b) oscillations c) Constant steady state error   d) less stable system

4. For the system $G(s)\,H(s) = (s+4) / (s-2)\,(s+3)$, type no. and order of the system is

    a) Type 2, Order 0   b) Type 2, Order 2   c) Type 0, Order 2   d) Type 0, Order 0

5. The effect of PD Controller is to increase the _____.

    a) Damping frequency   b) Damping time   c) Damping factor   d) Damping ratio

6. A frequency response is the steady state response of a system when the input to the system is a

    a) Sinusoidal signal   b) ramp signal   c) Step signal   d) parabolic signal

7. The symmetry of roots with respect to both real and imaginary axis is called_____.

    a) Nyquist stability   b) root locus   c) Auxiliary symmetry   d) quadrantal symmetry

8. The meeting point of asymptotes with real axis is called_____

    a) root locus on real axis b) break away point   c) angle of departure   d) centroid

9. Phone margin γ =

    a) $180 + \varphi_{gc}$ b) $180 - \varphi_{gc}$ c) $180 \pm \varphi_{gc}$ d) Equal to φ_{gc}

10. The compensation can be done by _____ method.

    a) Routh Hurwitz   b) Root locus   c) Mechanical system   d) Electrical system

PART B (10 x 2 = 20 Marks)

11. Compare open loop and closed loop system.

12. Define transfer function.

13. What is transient response?

14. List the time domain specifications.

15. What is frequency response?

16. Define gain margin?

17. Define relative stability

18. What are root loci?

19. What are the three types of compensators?

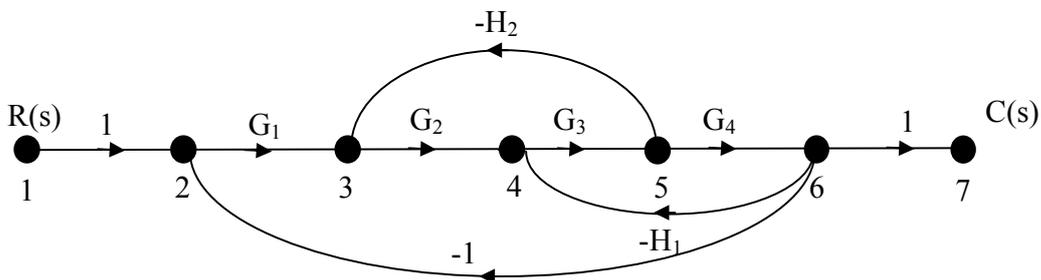20. When is lag lead compensator required?

PART C (5 x 14 = 70 Marks)

21. a) Determine the transfer function X1(S) / F(S) and X2(S) / F(S) of the mechanical system shown in figure.
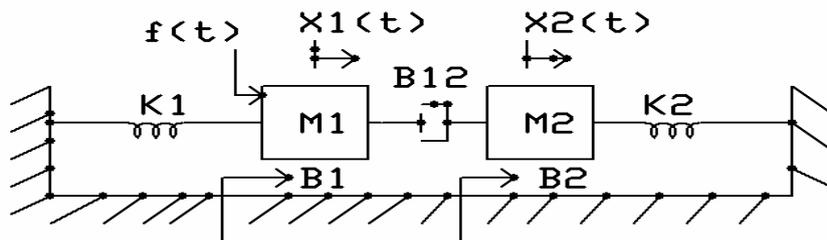
(OR)

b) Determine the transfer function of the system shown in the following figure.

22. a) Derive an expression for the time response of an under damped II order system subjected to unit step input. Plot the response and mark the time domain specifications in it. Define rise time, peak time, peak overshoot and settling time.

(OR)

b) Enumerate the advantages of generalized error co-efficient and determine the generalized error co-efficient and steady state error for a system whose open loop transfer function is G(s) = 1 / (s (s + 1) (s + 10)) and the feedback transfer function is H(s) = (s + 2) with input r(t) = 6 + t + t².

23. a) Draw the Bode plot of the system whose open loop transfer function is

G(s) H(s) = K / (s (1 + s) (1 + 0.1 s) (1 + 0.02 s)). Determine the value of K for the gain margin of 10 dB.

(OR)

b) The open 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) Determine the range of K for stability of unity feedback system whose open loop

transfer function is $G(s) = \dfrac{K}{s(s+1)(s+2)}$. Using root locus method.

(OR)

b) Construct routh array and determine the stability of the system. Comment on the location of the roots of characteristic equation.

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

(ii) $s^6+2s^5+8s^4+12s^3+20s^2+16s+16=0$

25. a) Explain the design procedure of lead compensator with examples.

(OR)

b) Explain the design procedure of lag compensator with examples.

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