ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : DECEMBER 2009

REGULATIONS : 2007

FIFTH SEMESTER - ELECTRICAL & ELECTRONICS ENGG.

070280046 - CONTROL SYSTEMS

TIME : 3 Hours Max.Marks : 100

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Define transfer function.
2. Name two types of electrical analogous for mechanical system.
3. What is a signal flow graph?
4. What is servomechanism?
5. List the time domain specifications.
6. Define peak overshoot.
7. A unity negative feed back system has K_p=5.What steady- state error can be expected for inputs of 6u(t) and 6t u(t) ?
8. Why derivative controller is not used in control system?
9. Define Gain Margin.
10. What are the main advantages of Bode plot?
11. What are M circles?
12. List out the different frequency domain specifications?
13. State Nyquist stability criterion.
14. What are the main significances of root locus?
15. What is limitedly stable system?
16. What is centroid? How the centroid is calculated?
17. What is a compensator?
18. When is the lag - lead compensator required?

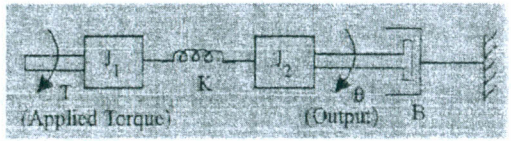
19. Write the procedure for designing the lag compensator.
20. What are the advantages and disadvantages in frequency domain design?

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. Write the differential equations governing the mechanical rotational system shown in figure. Obtain the transfer function of the system.



22. Explain the construction and working principle of AC servomotor

23. a. Write the standard test signals used in the control system 4

b. Obtain the unit ramp and unit impulse response of a first order system. 8

24. Draw the Bode plot for the open loop transfer function

$G(s) = \frac{k}{S(S+1)(0.1S+1)}$. Determine Phase margin and Gain margin.

i.Find the value of k to give a gain margin 10dB.

ii.Find the value of k to give a gain margin 30dB

iii.Find the value of k to give a phase margin of 24°

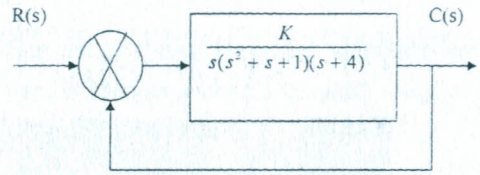
iv. The marginal value of k for stability.

25. a. Construct the routh array system for the equation 4

$s^4+8s^3+18s^2+16s+5=0$ and comment on stability of the system.

b. Consider the closed-loop transfer feedback System shown in fig. Determine 8

the range of k for which the system is stable.



26. Sketch the root locus plot for 0<K<∞.Given, $G(s)H(s)=\frac{K(s^2-4s+20)}{(s+2)(s+4)}$.

Find the following:

a. The gain ,k at the jω-axis crossing,

b. The gain at the point where the locus crosses the 0.45 damping ratio line

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

28. Consider the unity feedback system whose open loop transfer function is $G(s)=\frac{K}{s(s+3)(s+6)}$. Design a lag-lead compensator to meet the following specifications. (i) Velocity error constant, K_v = 80 (ii) phase margin, γ ≥ 35°

*****THE END*****