# T 8192

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fourth Semester

Mechatronics Engineering

EE 1264 — CONTROL SYSTEMS

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between open loop and closed loop systems.

2. What are the advantages of block diagram reduction technique?

3. Define the transfer function of a system.

4. What are the different types of error coefficients?

5. What are the basic elements in mathematical modeling?

6. What is meant by non-minimum phase system?

7. What are the conditions of stability?

8. Define root contour.

9. What is the transfer function of a lead compensator?

10. How do you represent partial fraction in MATLAB?

PART B — (5 × 16 = 80 marks)

11. (a) (i) State Mason's gain formula. Define the terminologies associated with the signal flow graphs. (8)

(ii) Obtain the closed loop transfer function of the system shown in Fig. 11 (a) using block diagram reduction technique. (8)

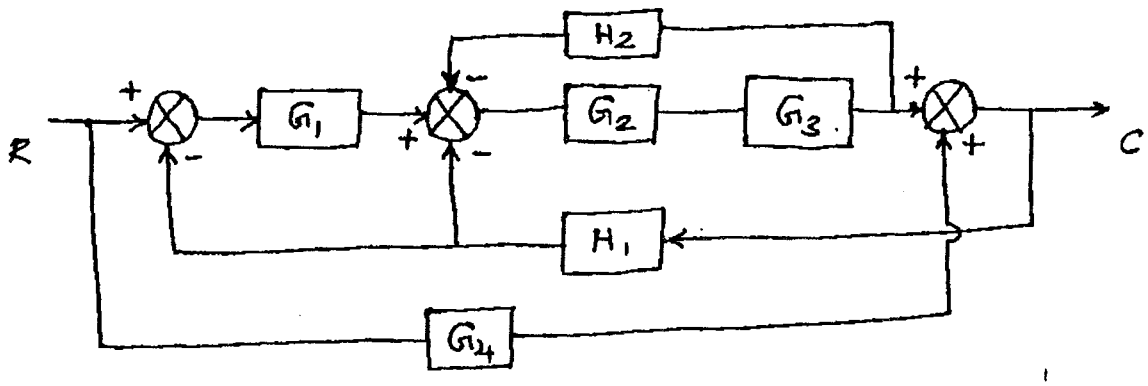


Fig. 11 (a)

Or

(b) For the signal flow graph in Fig. 11 (b) find $C(s)/R(s)$ using Mason's gain formula. (16)

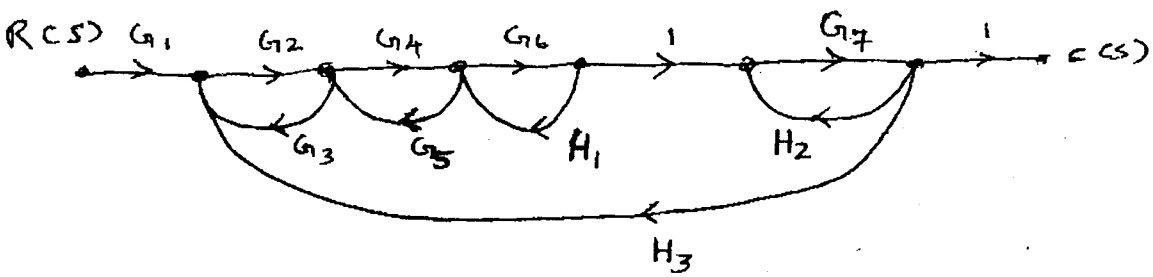


Fig. 11 (b)

12. (a) (i) Obtain the time response of a second order system for a unit step unit. (8)

(ii) It is desired that a second order system should have a maximum overshoot of 20% and the settling time must not exceed two seconds. Determine the values of damping ratio and natural frequency. (8)

Or

A unity feedback system is characterised by the open loop transfer function $G(s)=\frac{1}{s(0.5s+1)(0.2s+1)}$. Determine the steady state error, for unit step, unit ramp and unit acceleration input. Also determine the damping ratio and natural frequency of dominant roots. (16)

(a) The transfer function of the forward path of a unity feedback system is given by $G(s)=\frac{40}{s(s+2)(s+8)}$. Using Bode plot determine the gain margin, phase margin and cross over frequencies. (16)

Or

(b) Sketch the Bode plot and determine the gain and phase margin for the unity feedback system where transfer function $G(s)=\frac{10}{s(s+1)(s+5)}$. (16)

14. (a) (i) State and explain Routh's Hurwitz criterion for stability. (8)

(ii) Check the stability of a feedback system whose characteristic equation is $s^3+2s^2+4s+9=0$. (8)

Or

(b) Sketch the root locus for the unity feed back system whose open loop transfer function is $G(s)=\frac{k}{s(s+3)\left(s^3+2s+2\right)}$. (16)

15. (a) Write the design steps to draw a lead compensator using root locus technique. (16)

Or

(b) Obtain the transfer function of phase lag compensating network and also sketch the corresponding Bode plot. (16)