

B.E. DEGREE EXAMINATIONS: NOV/DEC 2010

Fourth Semester

MECHATRONICS ENGINEERING

U07MH404: Control Systems

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

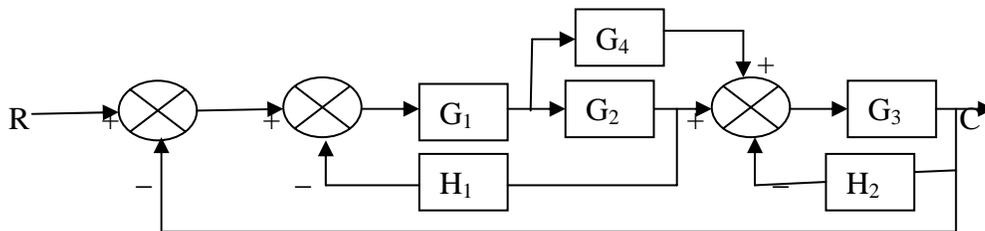
1. Feedback element is used for
A) Error detection B) Increase gain C) Decrease gain D) Increase Bandwidth
2. Fundamental component of mechanical system is
A) Inductance B) Mass C) Pressure D) Temperature
3. The response of over damped system is
A) Fast B) Slow C) Very Slow D) Very Fast
4. Derivative controller is used for
A) Increase settling time B) Increase overshoot
C) Decrease overshoot D) Decrease settling time
5. Damping factor for undamped system is
A) 1 B) 0 C) 0.5 D) 2
6. Phase crossover means
A) Frequency at which crossover occurs B) Point at which magnitude plot crossover
C) Frequency at which gain crossover occurs D) Point at which the phase plot crosses
7. Zeros of the system represents
A) Roots of numerator B) Roots of denominator
C) Roots of polynomial Equation D) None of the above
8. For stable system
A) Roots should lie in right of s plane B) Roots should lie in right and left of s plan
C) Roots should lie in left of s plane D) Roots should lie at origin of s plane
9. Lead compensation means
A) Adding a dominant Pole B) Adding a pole C) Adding a zero D) Adding a dominant zero
10. The effect of adding pole to the system is
A) Increase relative stability B) Decrease relative stability
C) Decrease delay time D) Increase rise time

PART B (10 x 2 = 20 Marks)

11. What are the different types of control system?
12. Define transfer function.
13. Mention the test signals used in control system.
14. What is first order system? Give example.
15. List the advantages of frequency response analysis.
16. Define Bandwidth. Give the expression.
17. Why bode plots are commonly used in the frequency domain analysis?
18. Define Phase Margin.
19. What are dominating poles and zeros?
20. What is compensated system?

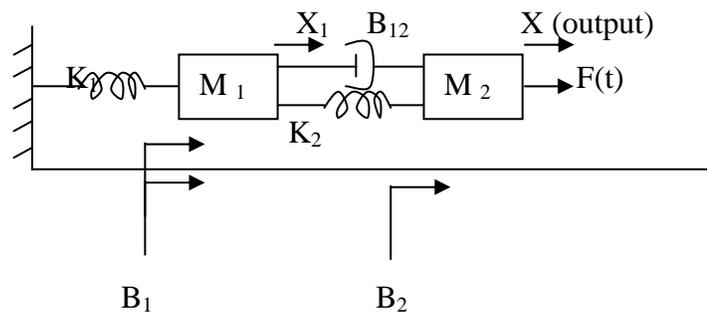
PART C (5 x 14 = 70 Marks)

21. (a) (i) Compare open loop and closed loop system.
 (ii) Use block diagram technique to find the transfer function.



(OR)

- (b) (i) Obtain the transfer function of the mechanical system shown in figure.



- (ii) Explain Mason's gain formula in detail.

22. (a) What are the time response specifications? Derive the expression for those specifications.

(OR)

(b) (i) Obtain unit step response of the following system

$$C(S)/R(S) = 10 / (S^2+2S+10)$$

(ii) Explain about PI and PID controllers and their characteristics.

23. (a) Draw the bode plot for the unity feedback system with open loop transfer function.

Hence find phase margin and gain margin $G(S) = 0.5 / (S(S^2+S+1))$

(OR)

(b) (i) Explain in detail about all pass and minimum phase systems.

(ii) Sketch the polar plot for the system with open loop transfer function.

$$G(S)H(S) = 1 / (S+4)(S+2)$$

24. (a) Explain in detail about the rules for constructing rules for root locus.

(OR)

(b) Determine the stability of the system whose characteristics equation is given by

$$S^5+2S^4+3S^3+6S^2+5S+3$$

25. (a) Explain the steps to design lag compensator in detail.

(OR)

(b) Write a program in Matlab to design a lead compensator with an suitable example.
