G 1085

(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Electronics and Communication Engineering

CONTROL SYSTEMS (L)

(Old Scheme—Prior 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Give an example for open-loop and closed-loop control System.
2. Write mason's gain formula.
3. What is type and order of system ?
4. What are the advantages of generalized error series ?
5. Define : gain margin and phase margin.
6. What are M and N circles ?
7. Write short note on frequency domain specifications.
8. What is centroid ?
9. What is the need for compensator ?
10. Sketch the electrical circuit of a lag-lead compensator.

(10 × 4 = 40 marks)

Part B

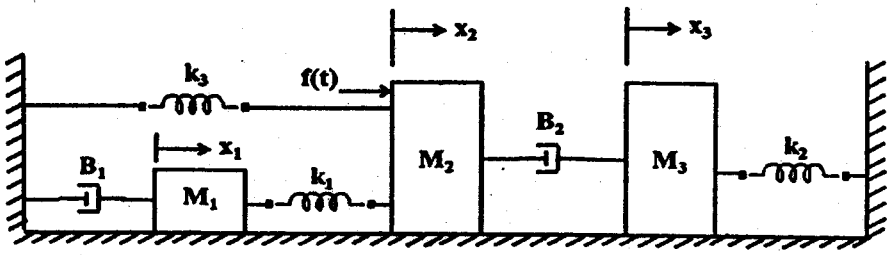
Answer **all** *questions.*
Each question carries 12 *marks.*

11. Explain open-loop and closed-loop control systems with an example.

Or

Turn over

12. Write the differential equations governing the mechanical system shown in figure.



13. Consider the open-loop transfer function of a unity feedback control system :

$$G(s) = \frac{K(s+2)}{s(s+4)(s+6)}$$

Using Routh criterion, find the range of values of K that corresponds to a stable system. Note that K is a positive real constant.

Or

14. For a system with, $GH(S) = \frac{5}{s+5}$, calculate the generalized error coefficients and the steady state error. Assumer $(t) = 6 + 5t$.

15. Sketch the Bode plot for the following transfer function and determine phase margin and gain margin :

$$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}.$$

Or

16. Sketch the Nyquist plot for a system with the open-loop transfer function

$$G(s)H(s) = \frac{K(1+0.5s)(s+1)}{(1+10s)(s-1)}$$

Determine the range of values of K for which the system is stable.

17. A feedback control system has an open-loop transfer function

$$G(s)H(s) = \frac{K}{s(s+3)(s^2+2s+2)}$$

Find the root locus as K is varied from 0 to ∞.

Or

18. Explain the frequency domain specifications of a typical system.

19. The open-loop transfer function of a System is given by

$$G(s) = \frac{K}{s(s+1)(s+4)}$$

Design a suitable lag compensator to meet the following specifications.

Phase margin = 43°, Bandwidth = 1.02 rad/sec. Velocity error constant, $K_v \geq 5\ sec^{-1}$.

Or

20. Determine the transfer matrix for the system :

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 4 & 6 \\ -5 & 0 \end{bmatrix} \begin{bmatrix} U_1 \\ U_2 \end{bmatrix}$$

$$\begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 8 & 1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}.$$

(5 × 12 = 60 marks)