

Code: 15A02303

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

CONTROL SYSTEMS ENGINEERING

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

Use of Polar graph, Bode graph sheet & Nyquist plot chart is allowed.

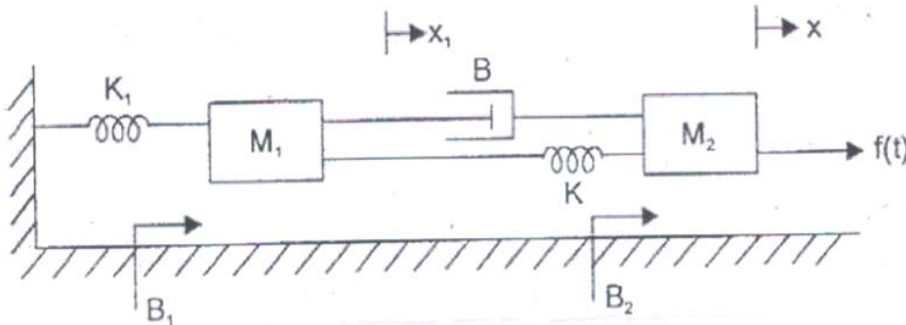
- 1 Answer the following: (10 X 02 = 20 Marks)
 - (a) What is meant by synchro?
 - (b) Differentiate open and closed loop control system.
 - (c) Find the impulse response of the system $H(s) = 4s/(s+2)$ with zero initial conditions.
 - (d) Find the value of velocity error constant for second order system using step input.
 - (e) What is dominant pole?
 - (f) Define conditionally stable system.
 - (g) Write the expression for resonant frequency in frequency response analysis.
 - (h) What is meant by Nyquist plot?
 - (i) Define controllability of a system.
 - (j) What are the advantages of state space representation?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

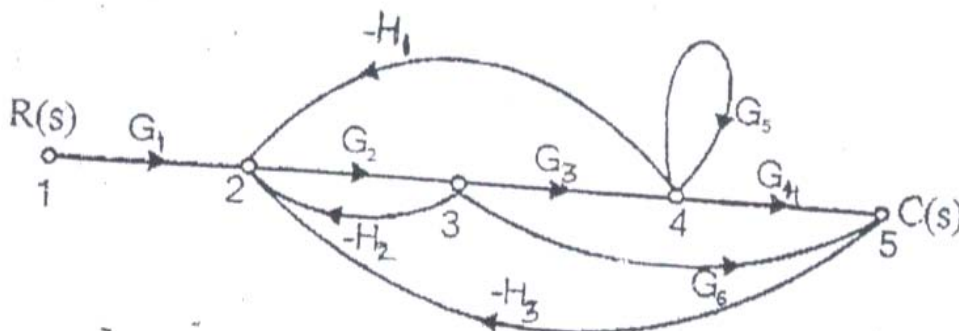
UNIT – I

- 2 Determine the transfer function $X(S)/F(S)$ for mechanical system.



OR

- 3 Find the transfer function $C(S)/R(S)$ for the system using signal flow graph.



Contd. in page 2

UNIT - II

- 4 Derive the response of under damped second order system for unit step input.

OR

- 5 The open loop transfer function of a system with unity feedback $G(S) = K/S(ST + 1)$, where K and T are positive constants. By what factor should the amplifier gain K be reduced, so that the peak overshoot of the unit step response of the system is reduced from 75% to 25%?

UNIT - III

- 6 Draw the root locus plot for the system whose open loop transfer function is given by:

$$G(S)H(S) = K(S + 3)/[S(S + 1)(S + 2)(S + 4)]$$

OR

- 7 Obtain the Routh array for the system whose characteristic polynomial equation is:

$$S^7 + 5S^6 + 9S^5 + 9S^4 + 4S^3 + 20S^2 + 36S + 36 = 0. \text{ Check the stability.}$$

UNIT - IV

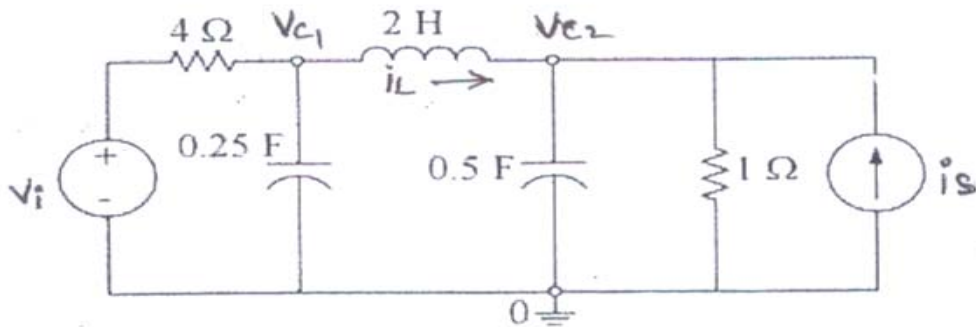
- 8 Explain in detail about design procedure of lead compensator technique.

OR

- 9 Sketch the bode plot for the given transfer function: $G(S) = K S^2 / [(1 + 0.2S)(1 + 0.02S)]$ and determine the value of K for the gain cross over frequency of 5 rad/sec.

UNIT - V

- 10 (a) Obtain the state transition matrix for state model whose system matrix A is given by: $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$.
(b) Write the state equation shown in figure below.



OR

- 11 A system is represented by the state equation $\frac{dx}{dt} = AX + BU; Y = CX$ where $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & -8 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 8 \end{bmatrix}$ and $C = [1 \ 0 \ 0]$. Determine the transfer function of the system.
