Code: 15A02303

SS

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 chat is allowed.

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1 Answer the following: (10 X 02 = 20 Marks)

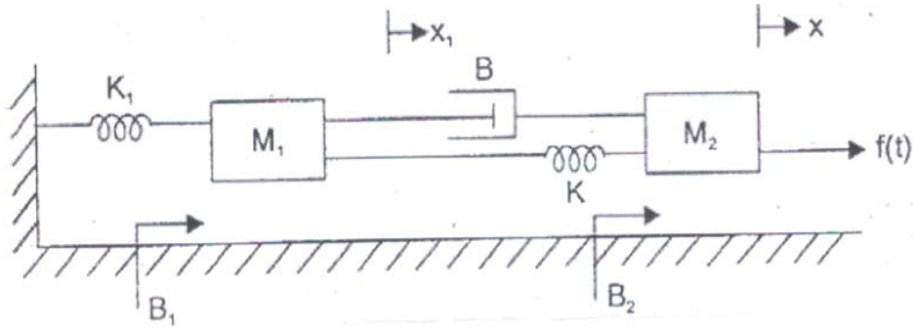
(a) What is meant by synchro?
(b) Differentiate open and closed loop control system.
(c) Find the impulse response of the system H(s) = 4 s/(s+2) with zero initial conditions.
(d) Find the value of velocity error constant for second order system using step input.
(e) What is dominant pole?
(f) Define 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)

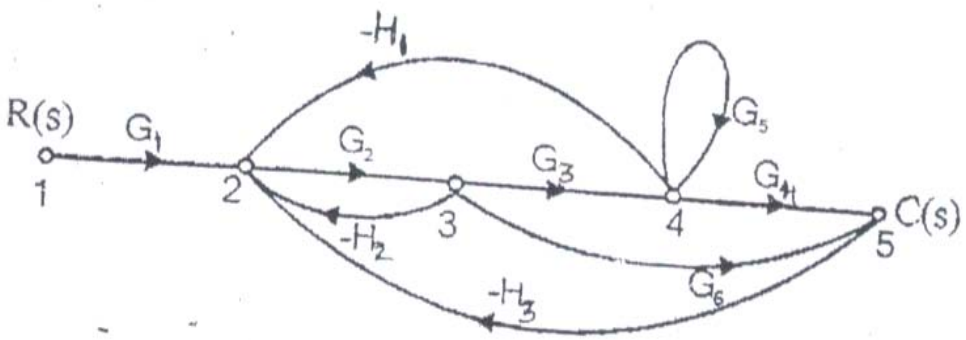
UNIT – I

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.



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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:
$S^7 + 5S^6 + 9S^5 + 9S^4 + 4S^3 + 20S^2 + 36S + 36 = 0$. Check the stability.

UNIT – IV

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

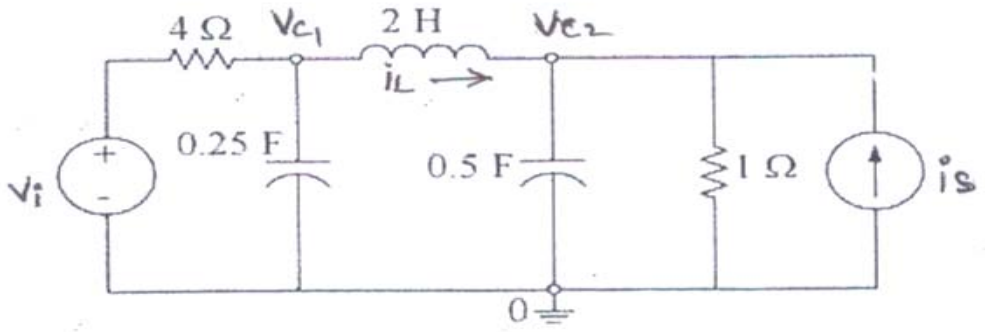
OR

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 $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & -8 \end{bmatrix}$, $B = \begin{bmatrix} 0 \\ 0 \\ 8 \end{bmatrix}$ $and\ C = [1 \quad 0 \quad 0]$. Determine the transfer function of the system.

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