(DEE 311)

B.Tech DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Third Year)

ELECTRICALS AND ELECTRONICS

Paper - I : Linear Control Systems

Time : 3 Hours   **Maximum Marks : 75**

Answer question No.1 compulsory   *(15)*

*Answer ONE question from each unit*   *(4 × 15 = 60)*

1)   a)   Define closed loop control system.

     b)   What is the importance of feed back?

     c)   Write the applications of closed loop system.

     d)   Define sensitivity.

     e)   Calculate number of poles and zeros for a given transfer function $\dfrac{2(S+1)}{S(S+2)\,(S+3)}$.

     f)   The closed loop transfer function is $\dfrac{4}{S^2+5S+16}$. Calculate open loop transfer function.

     g)   What is the importance of Mason's gain formula?

     h)   Draw the step and ramp signals.

     i)   Define steady state error.

     j)   Consider a system with the transfer function $\dfrac{S+6}{KS^2+S+6}$. Its damping ratio will be 0.5. Calculate the K value.

k) Calculate the number of roots in left half of the S-plane for a given characteristic equation $S^3 + 5S^2 + 7S + 3 = 0$.

l) The root locus of the system $G(s)H(s) = \dfrac{K}{S(S+2)(S+3)}$. Calculate the break-away point.

m) Define Gain margin and Phase margin.

n) What is the importance of Compensator?
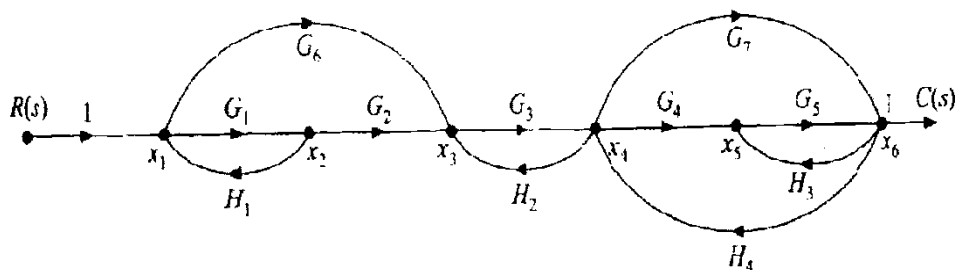
o) Define state transition matrix.

UNIT – I

2) a) Find the transfer function of the following system shown in figure.
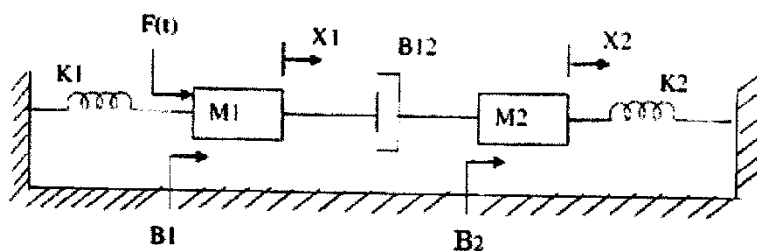
b) Explain the open loop & closed loop system.

OR

3) a) Obtain the transfer function using mason gain formula for the given signal flow graph.

b) Explain the basic elements of control systems.

UNIT - II

4) a) Find all the time domain specifications of a unity feedback control system whose open loop is given by $G(s) = \dfrac{25}{S(S+1)(S+2)}$.

b) Explain RH stability criterion with difficulties.

5) Define the following systems and sketch their output wave from for an unit step input

a) Under damped system

b) Over damped system

UNIT - III

6) a) Consider the sixth-order system with characteristic equation.

$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16 S + 16 = 0$. Comment on the stability.

b) Sketch the root locus for the unity feedback system whose open loop transfer function is

$$G(s)H(s) = \frac{K(S + 2)}{S(S+1)(S^2 + 6S + 25)}.$$

OR

7) Draw the Bode plot for the system having the following transfer function :

$$G(s) = \frac{20}{s(1+3s)(1+4s)}.$$

UNIT - IV

8) Write short notes on the following:

a) Lead Compensator

b) Lag Compensator

OR

9) a) Derive the expression for the transfer function from the state model.

$X = Ax + Bu$ and $y = Cx + Du$.

b) Find the state transition matrix for a given system matrix $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$.

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