Unit - IV

4. a) State and explain the Nyquist stability criteria.
   b) What are Bode plots? State the advantages of Bode plots.
   c) Explain the concepts of gain margin and phase margin.
   d) Construct the Bode plot for the system having

$$G(s)=\frac{80}{s(s+2)(s+20)}$$

From the Bode plot determine

i) Gain and phase margin

ii) Gain and phase cross over frequencies.

OR

Construct the Nyquist plot for a unity feedback system whose open loop transfer function is given by

$$G(s)H(s)=\frac{k}{s\left(s^2+2s+2\right)}$$

Find the maximum value of k for which the system is stable.

Unit - V

5. a) What is a compensation of control system? Explain.
   b) What are the effects of phase-lead compensation?
   c) Write the procedure to design a phase-lead compensator.
   d) Explain the different steps to design a phase lag compensator using Bode plot.

OR

Explain the different steps to design a phase lag compensator using Root locus.

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Roll No .....

EX - 602

B.E. VI Semester

Examination, June 2015

Control Systems

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

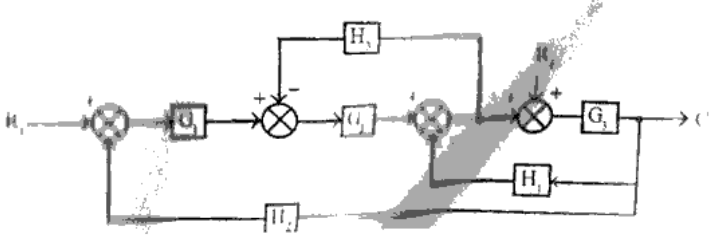
ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

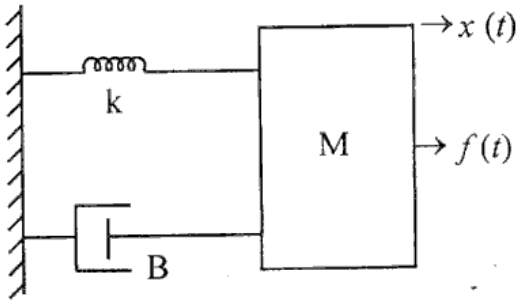
Unit - I

1. a) Define open loop and closed loop Control Systems.
   b) Differentiate between linear and non-linear Control Systems.
   c) What is a feedback in Control System? Explain the effects of feedback.
   d) Obtain the overall transfer function of the system given below using block diagram reduction method.



OR

Draw the free body diagram and write the differential equations describing the dynamics of the system given below. Also obtain the overall transfer function.



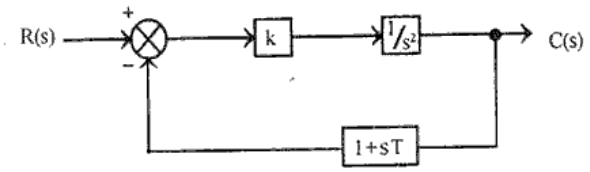
Unit - II

2. a) Differentiate between transient response and steady state response of the system.

   b) What is meant by proportional control? What is its effect on the performance of the system?

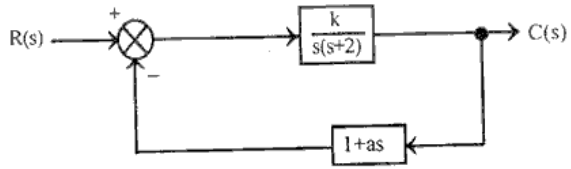
   c) Explain the effect of damping factor ζ on the performance of second order system for a step input.

   d) For the system given below by block diagram compute the values of k and T to give overshoot 20% and peak time of 2 seconds.



OR

For the system given below determine the values of k and a such that the system has damping ratio of 0.67 and Undamped natural frequency of 3.65 rad/s.



Unit - III

3. a) For a root locus diagram define the followings:
   i) Centroid
   ii) Asymptote
   iii) Break away point

   b) What are the conditions to be satisfied for the root locus to exist at any point in s-plane?

   c) State the effects of adding poles to G(s) H(s) on the root locus.

   d) Sketch the root locus of a unity feedback system with forward path transfer function given below. k is varied from zero to infinity.

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

OR

For the unity feedback system, the open loop transfer function is given by

$$G(s)=\frac{k(s+3)}{s(s+2)}$$

Sketch the root locus for the system when k is varied from zero to infinity.