EX - 602

B.E. VI Semester

Examination, June 2014

Control Systems

Time : Three Hours

Maximum Marks : 70

Note: Attempt one questions from each unit. All questions carry equal marks.

Unit - I

1. a) Determine the over all transfer function relating C and R for the system whose block diagram is shown in fig-1.

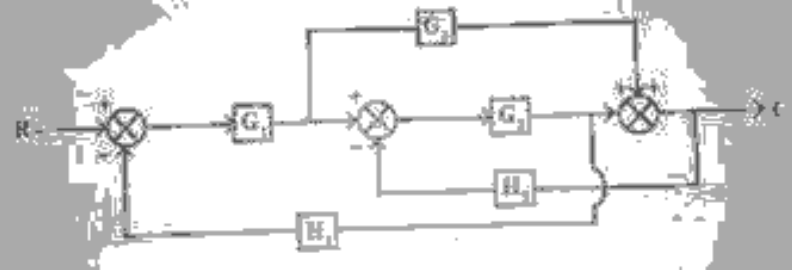

Fig.1

b) Using Mason's gain formula determine the ratio C/R for the system shown in fig.1.

OR

2. a) Determine the transfer function relating output Wm (s) and the input $V_f(s)$ for a field controlled DC motor.

b) The scheme given in fig 2 represents a voltage regulator, determine the value of the reference voltage. Given that $R_2 = 100\Omega$

Unit - II

3. a) The forward path transfer function of a unit feedback control system is given by $G(s) = \frac{2}{S(S+3)}$

Obtain the expression for unit step response of the system.

b) Explain integral control on a second order unity feed back control system

OR

4. a) Fig. 3 represents a control system. Obtain an expression relating the output and time. The input being a unit step.

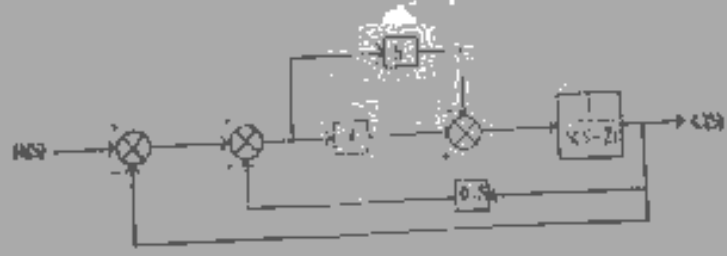

Fig.3

b) The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{k}{S(ST_1+1)(ST_2+1)}$ Applying Hurwitz criterion determine the value of K for the system to be stable.

Unit - III

5. a) How to characterize equation of a closed loop system root loci.

   b) How to determine stability by root loci.

OR

6. a) How to construct root loci of a control system explain with the help of suitable example.

   b) What is the effect of adding poles and zeros on the loci.

Unit - IV

7. Sketch the Bode plot for the open loop transfer function for the unity feedback system given below and assess the stability.

$$G(s) = \frac{50}{(S+1)(S+2)}$$

OR

8. Using Bode plot method determine the gain cross over and phase cross over frequency for the transfer function

$$G(s)\,H(s) = \frac{1}{s(0.025s+1)(0.25s+1)}$$

Unit - V

9. The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{K}{s(1+0.2s)}$.

Design a suitable compensator such that the system will have $K_v = 10$ and PM = 50°.

OR

10. The open loop transfer function of a unity feed back control system is given by $G(s) = \frac{K}{s(1+0.5s)(1+0.2s)}$

It is desired that

i) For a unit ramp input the steady state error of the output position be less than 0.125 degrees / (degree / second)

ii) the PM ≥ 30°

iii) The GM ≥ 10 dB

Design a suitable compensation network.

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