(c) Closed Loop stability

$$G(s)H(s) = \frac{2(S+0{\cdot}25)}{S^2(S+1)(S+0{\cdot}5)}$$ 14

7. Sketch the root locus for the open loop transfer function of a unity feedback control system given below and determine.
   (i) Value of K for S=0·5 14
   (ii) Value of K for marginal stability
   (iii) Value of K at S=–4

$$G(s) = \frac{K}{S(S+1)(S+3)}$$

8. Open loop transfer function for an unity feedback control system is $G(s) = \frac{K}{S(1+0{\cdot}25)}$

   Design suitable compensator such that system will have Kv=10. PM=50°.

9. Write short notes on any two: 7×2
   (a) Phase log compensation
   (b) Two phase a.c. servomotor

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Code : 031712

B.Tech.7th Semester Special Examination,2016

Linear Control Theory

Time : 3 hours *Full Marks : 70*

Instructions :

*(i) There are **Nine** questions in this paper.*

*(ii) Attempt **Five** questions in all.*

*(iii) **Questions No.1 is Compulsory.***

(iv) The marks are indicated in the right hand margin.

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1. Answer any seven questions fill in the blanks. 2×7=14
   (a) Laplace transform of t^{ne-at} is.....
   (b) Impulse response of a system having transfer function $\frac{1}{ST+1}$ is.....
   (c) Characteristic equation for a second order system is $S^2+1{\cdot}6S+16=0$. Rise time is .....
   (d) For an undamped system roots of the characteristic equation should lie on the ..... S plane.
   (e) Closed Loop control system having characteristic equation $S^3+4{\cdot}55^2+3.55+1{\cdot}5=0$ is .....
   Options ; (i) stable (ii) unstable

(f) No. of branches of root locus plot for an open loop transfer function for a closed loop system

$$G(s)H(s) = \frac{K}{S(S+1)(S+3)} \text{ .....}$$

(g) Steady state accuracy of a system in improved by ..... compensator.

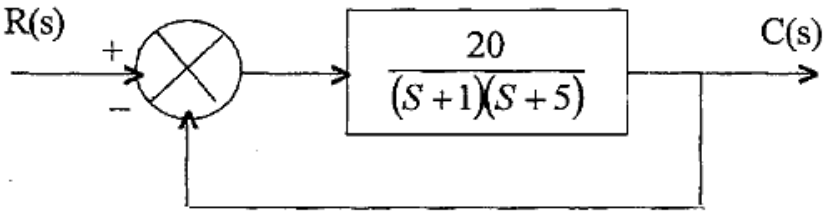
(h) 3 corner frequencies for the open loop transfer function

$$G(s)H(s) = \frac{2ls + 0.25}{S^2(S+1)(S+0.5)} \text{ are .....}$$

(i) Steady state error of system represented by $\frac{1}{ST+1}$ subjected to ramp input is.....

(j) Natural frequency of oscillation of a unity feedback system having open loop transfer function. $\frac{25}{S(S+5)}$ is.....

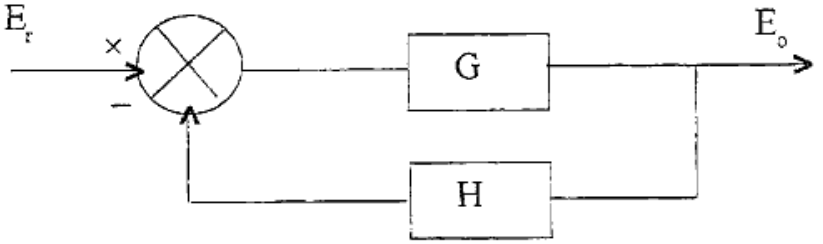
2. The block diagram of a unity feedback control system is



Determine peak time, maximum overshoot, time at which first undershoot occurs, time period of oscillations, and number of cycles completed before reaching steady state. 14

3. (a) Discuss static error coefficients. 7

(b) A closed loop control system shown in figure below. G=200, H=0·1. Determine reference voltage E_r for keeping E_o=250. 7



4. (a) Determine the transfer function of armature controlled dc servomotor. 7

(b) Using Routh-Hurwitz criterion determine the stability of a unity feedback control system whose open loop transfer function is given by $G(s) = \frac{\ell - ST}{S(S+2)}$ 7

5. Examine the closed loop stability of the system whose open loop transfer function is given by $G(s)H(s) = \frac{50}{(s+1)(s+2)}$ using Nyquist criterion. 14

6. Construct Bode Plot for the system whose open loop transfer function is given below determine.

(a) gain margin

(b) phase marginal