Date-19/12/19

Paper / Subject Code: 39206 / CONTROL SYSTEMS

S.E. (EXTC) (Sem-IV) (CBSGS) (R-2012)

(3 Hours) **Max Marks: 80**

Note:
1. **Question No. 1 is compulsory.**
2. **Out of remaining questions, attempt any three questions.**
3. **Assume suitable additional data if required.**
4. **Figures in brackets on the right hand side indicate full marks.**

1. **(A)** Explain the transient and steady – state response. Draw these responses for first and second – order systems. **(05)**

(B) State the principle of optimality. Give list of various performance measures. **(05)**

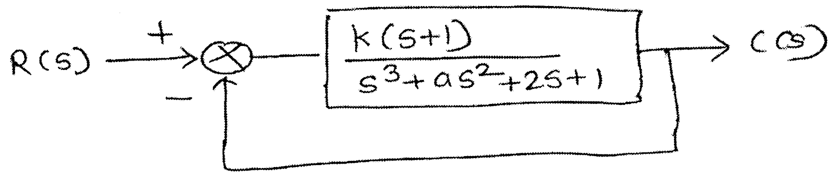
(C) Define gain and phase margin. Explain how to find gain and phase margins using polar plot. **(05)**

(D) Explain the concept of relative stability. **(05)**

2. **(A)** The open-loop transfer function of a servo system with unity feedback is $G(s) = \frac{10}{s(0.1s+1)}$ **(10)**

Evaluate the dynamic error using dynamic error coefficients.

(B) Determine the value of k > 0 and a > 0 so that the system shown oscillates at frequency 2 rad/sec . **(10)**



3. **(A)** A unity feedback control system has $G(s) = \frac{c}{s(s+c)}$ **(10)**

(i) Determine value of c so that maximum overshoot is 40%.

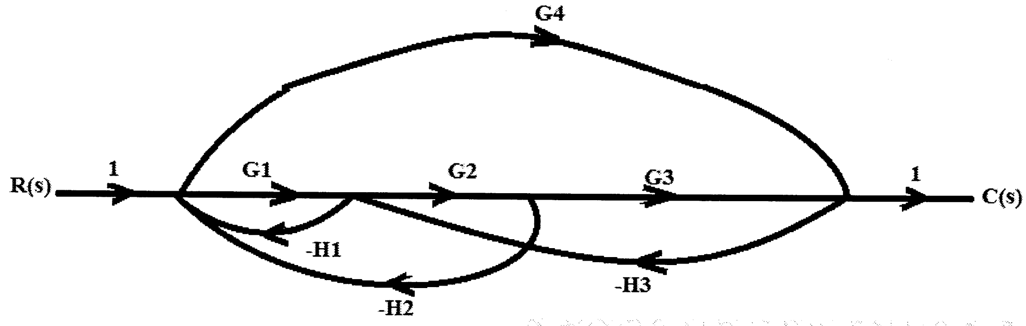
(ii) For this value of c, determine resonant peak value and resonant frequency.

(B) Sketch the root locus diagram of control system having, for the below given System. **(10)**

$$G(S)H(S) = \frac{k(s+4)}{s(s^2+6s+13)}$$

Also find the value of k for a system having damping ratio 0.707.

4. **(A)** (b) Determine the C(s)/R(s) of the following signal flow graph. **(10)**



(B) Using Nyquist criterion, investigate closed loop stability of the system whose open loop transfer function is given by **(10)**

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

5. **(A)** Explain error compensation methods and their effects on system performance. **(10)**

(B) Explain the concept of Neuro-Fuzzy adaptive control system. **(05)**

(C) Explain Mason's Gain Formula. **(05)**

6. **(A)** Determine the value of k for a unity feedback control system having open loop transfer function $G(s)H(s) = \frac{k}{s(s+2)(s+4)}$ **(10)**

such that (i) gain margin = 20 dB (ii) phase margin = 60^0

(B) (a) Compute the state-transient-matrix and response of the following system – **(10)**

$$\dot{x} = \begin{bmatrix} 0 & 0 & -2 \\ 0 & 1 & 0 \\ 1 & 0 & 3 \end{bmatrix} x \, ; x(0) = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

==========

****