Roll No.:.....

National Institute of Technology Delhi

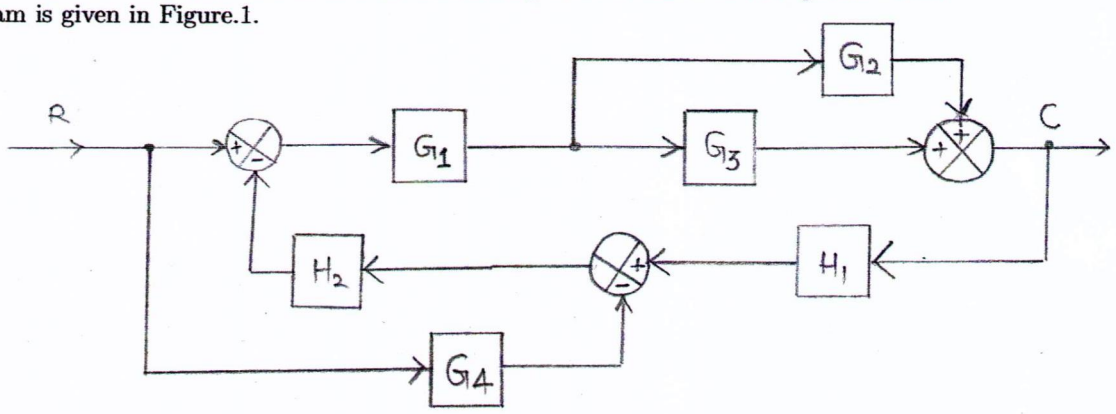
Name of the Examination: B.Tech.

Branch: ECE
Course Title: Control Theory
Time: 1.5 Hours

Semester: 4^{th}
Course Code: ECL 251
Maximum Marks: 25

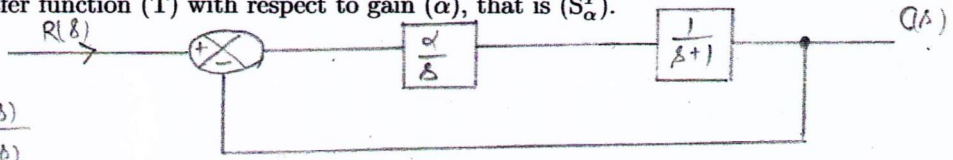
Note: Q.1 to Q.5 all carry 5 marks each, if the question is divided in to parts then marks are equally divided into all parts.

Q. 1. Draw a signal flow graph and evaluate the closed loop transfer function of a system whose block diagram is given in Figure.1.



(FIGURE-1.)

Q. 2. Block diagram of a control system is shown in Figure.2. Determine the senstivity of closed loop transfer function (T) with respect to gain (α), that is (S_α^T).



$T(s) = \frac{C(s)}{R(s)}$

(FIGURE-2)

Q. 3. Measurements conducted on a control system show the system response to be

$$c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$$

when subjected to a unit impulse input.
(i) Obtain the expression for the closed loop transfer fucntion.
(ii) Determine the undamped natural frequency and damping ratio of the system.