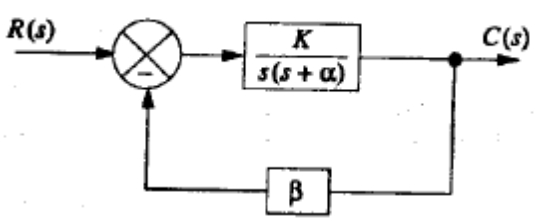
FINAL EXAM

ATTEMPT ANY FOUR QUESTIONS

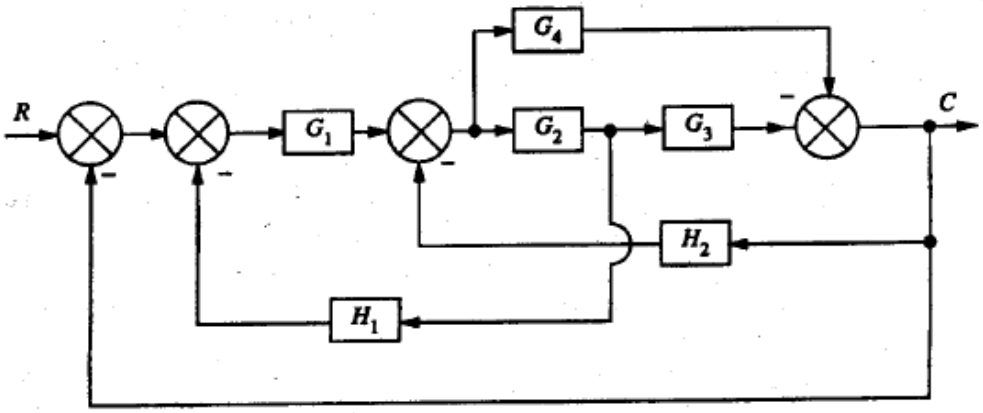
QUESTION ONE:

A position control system is shown below. Assume, $K = 10, \propto = 2, \beta = 1$. Evaluate: $S_K^T, S_\propto^T, S_\beta^T$. For $r(t) = 2cos0.5t$ and a 5% change in K, evaluate the steady – state response and the change in steady state response. **(20 Marks)**



QUESTION TWO:

a) Draw the SFC and determine C/R for the block diagram in Figure shown below. **(8 Marks)**

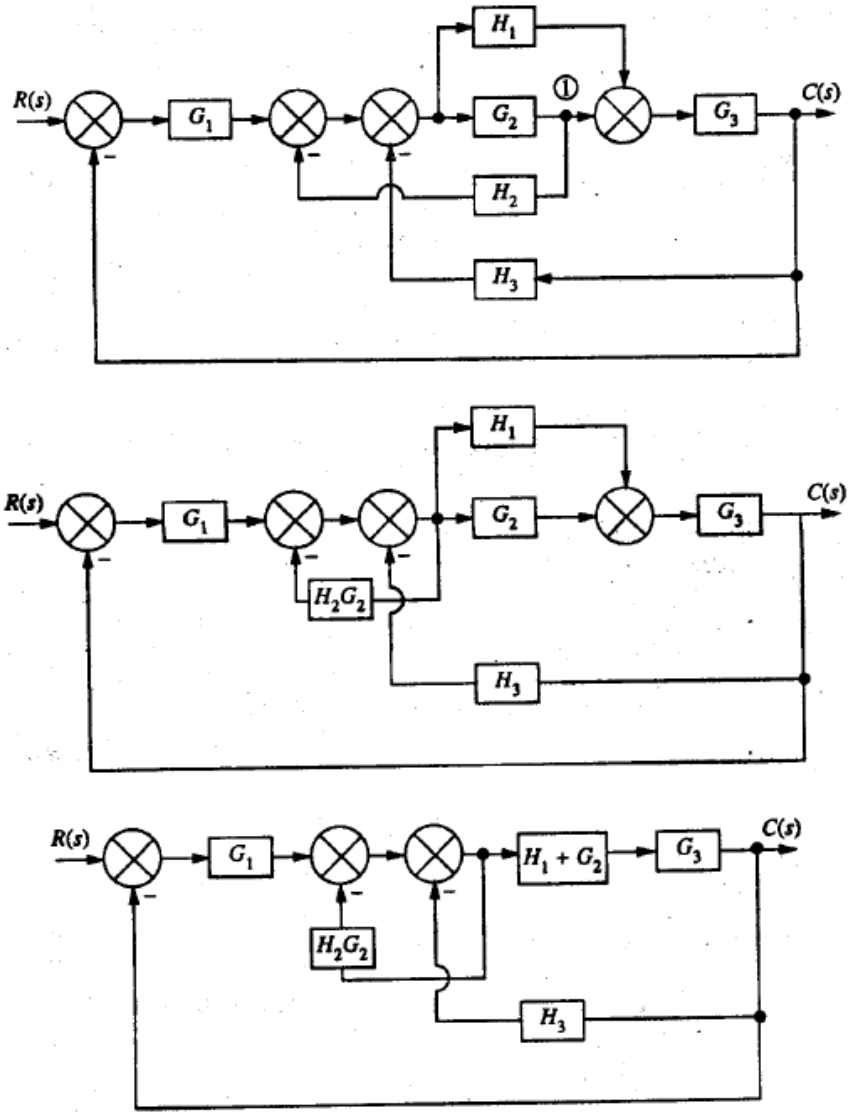


b) For the system represented by the following equations, find the transfer function $X(s)/U(s)$ by SFG technique. **(12 Marks)**

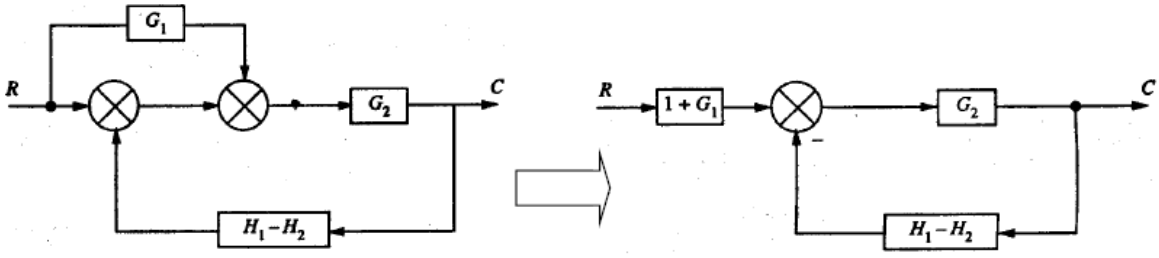
$$x = x_1 + \alpha_3 u$$
$$\dot{x}_1 = -\beta_1 x_1 + x_2 + \alpha_2 u$$
$$\dot{x}_2 = -\beta_2 x_1 + \alpha_1 u$$

QUESTION THREE:

a) Simplify the block diagram shown in Figure below. **(10 Marks)**

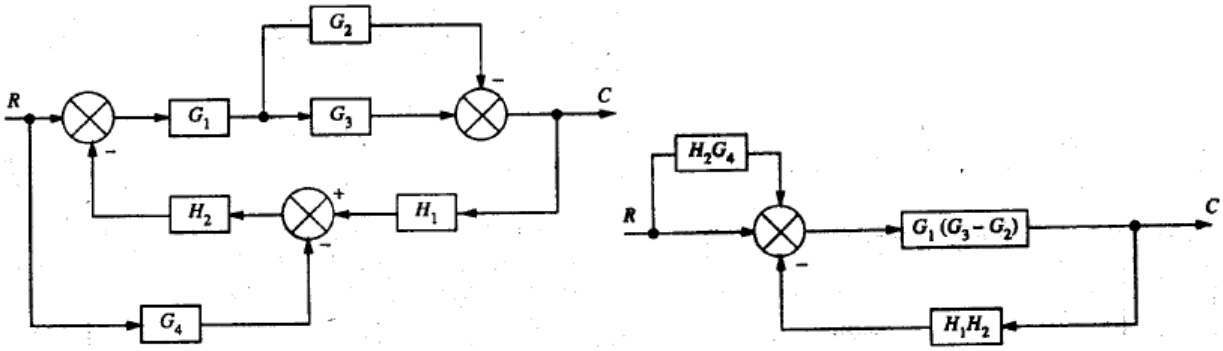


b) Obtain the transfer function C/R of the block diagram shown in Figure below. **(10 Marks)**

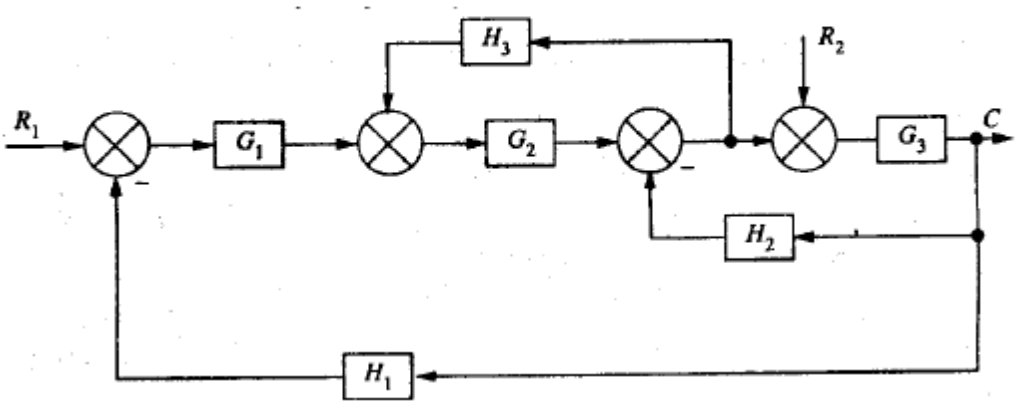


QUESTION FOUR:

a) Derive the transfer function of the system shown below. **(15 Marks)**

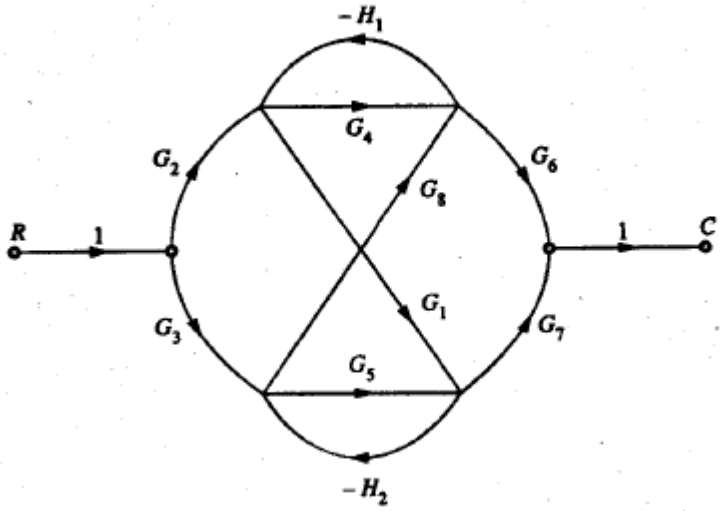


b) Find the output of the system shown below. **(10 Marks)**



QUESTION FIVE:

Consider the Figure below, and answer the questions illustrated in various sections.



a) Identify forward paths with path gains. **(6 Marks)**

b) Determine loops with loop gains and non-touching loops. **(6 Marks)**

c) Determine that, there are no combinations of more than two non-touching loops and derive the equations that govern such a combination. **(8 Marks)**

END