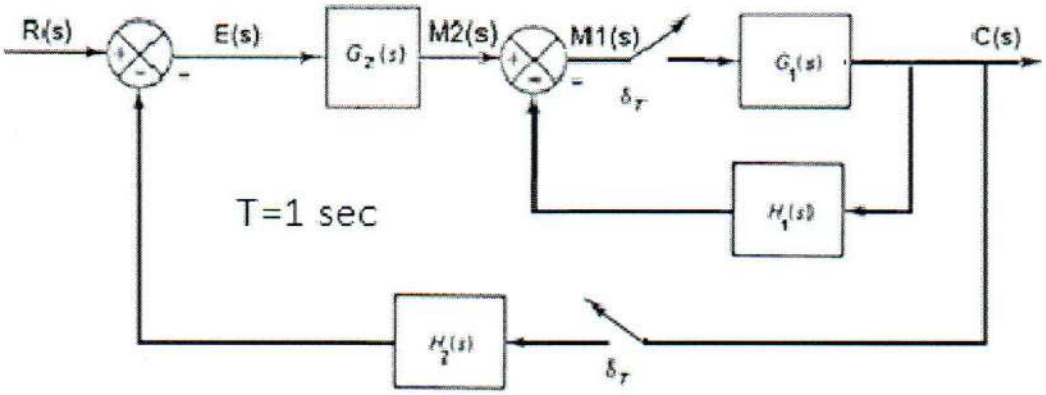
For the discrete data system shown below find:



Where $R(s) = \frac{1}{s}$, $G_1(s) = \frac{K}{s+1}$, $G_2(s) = \frac{s}{s+1}$, $H_1(s) = \frac{5s}{s+1}$, $H_2(s) = \frac{K}{s}$

K is a static gain, T = 1 sec

1. The continues time and pulse transfer functions. (*8 marks*)
2. Use the Jury test to find range of K makes the system stable when it is subjected to a unit step input. (15 marks)
3. Define the output sequence c(k) for a unit step input (*7 marks*)
4. The initial and final values of the system for a unit step input. (6 *marks*)
5. Output values c(3), c(4), c(5) of the system for a unit step input. (*4 marks*)

Table of Laplace and Z-transforms

	$X(s)$	$x(t)$	$x(kT)$ or $x(k)$	$X(z)$
1.	$\frac{1}{s}$	$1(t)$	$1(k)$	$\frac{1}{1-z^{-1}}$
2.	$\frac{1}{s+a}$	e^{-at}	e^{-akT}	$\frac{1}{1-e^{-aT}z^{-1}}$
3.	$\frac{1}{s^2}$	t	kT	$\frac{Tz^{-1}}{(1-z^{-1})^2}$
4.	$\frac{1}{(s+a)^2}$	te^{-at}	kTe^{-akT}	$\frac{Te^{-aT}z^{-1}}{(1-e^{-aT}z^{-1})^2}$
5.	$\frac{s}{(s+a)^2}$	$(1-at)e^{-at}$	$(1-akT)e^{-akT}$	$\frac{1-(1+aT)e^{-aT}z^{-1}}{(1-e^{-aT}z^{-1})^2}$
6	-	-	a^k	$\frac{1}{1-az^{-1}}$

Initial value: $x(0) = \lim_{z\to\infty} X(z)$ - **Final value :** $x(\infty) = \lim_{z\to 1}[(1-z^{-1})X(z)]$