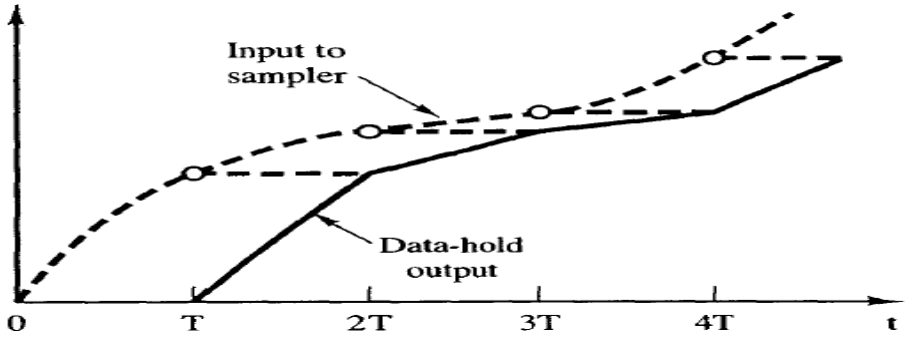
1- Derive the transfer function of the z-order hold assuming a unit ramp input to the sampler.
2- Derive the transfer function of the first-order hold assuming a unit ramp input to the sampler.
3- Obtain the starred- and- z transform of:-

a- $X(s) = \frac{20}{(s+2)(s+5)}$
b- $X(s) = \frac{5}{(s)(s+1)}$
c- $X(s) = \frac{s^2+5s+6}{(s)(s+4)(s+5)}$
d- $X(s) = \frac{s+2}{(s^2)(s+1)}$
e- $X(s) = \frac{s+2}{(s)(s+1)}$
f- $X(s) = \frac{2}{(s^2+2s+5)}$
g- $x(t) = e^{a(t-2T)}u(t-2T), t \geq 0$
h- $X(s) = \frac{e^{-2Ts}}{(s-a)}$

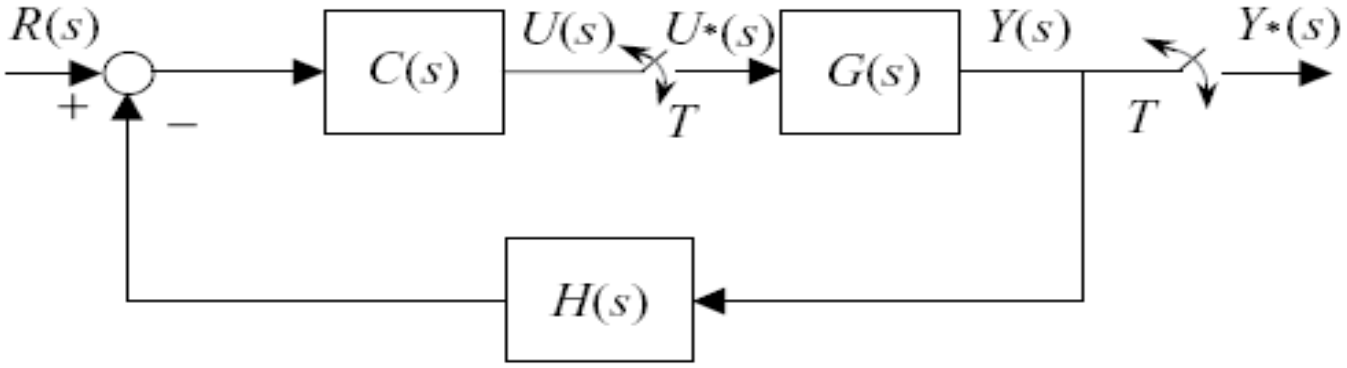
4- Obtain and plot the response of the following system when input is an impulse sampled version of the unit step function,

$$\frac{Y(s)}{X^*(s)} = \frac{s+2}{s^2(s+1)}.$$

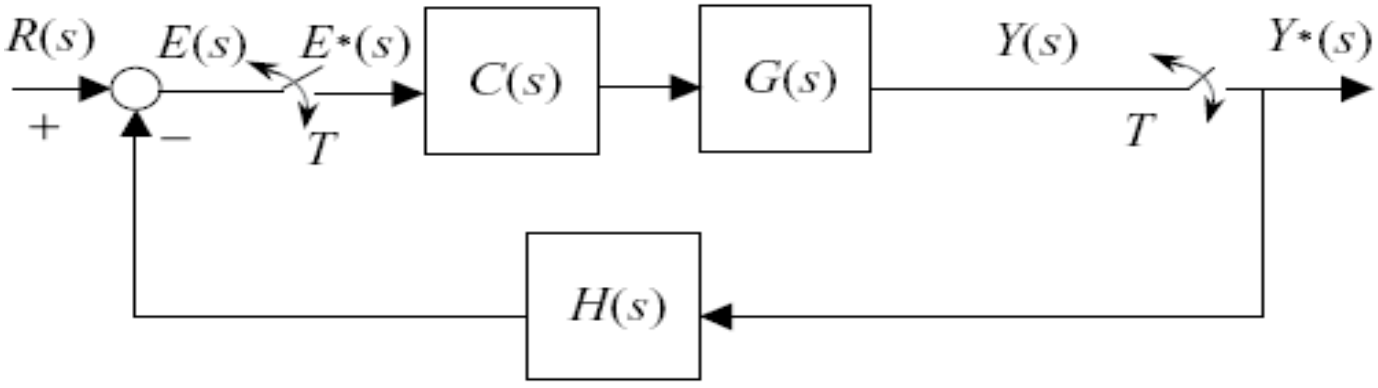
5- Find f(0), f(1), and f(10) for $F(z) = \frac{0.1}{z(z-0.9)}$ using direct division. Check f(0) using the initial value theorem.
6- Obtain the convolution of the two sequences {1, 1, 1} and {1, 2, 3}.
   a- Directly.
   b- Using z-Transform.
7- Given a first-order system of time constant 0.1 Sec., select a suitable sampling frequency and find the corresponding sampling period.
8- A closed-loop control system must be designed for a steady-state error not to exceed 5 percent, a damping ratio of about 0.7, and an un-damped natural frequency of 10 rad/s. Select a suitable sampling period for the system.
9- Will the answer of Q8 change if the system has a sensor delay of 0.02 Sec.? Justify your answer.
10- A data hold is to be constructed that reconstructs the sampled signal by the straight line approximation as shown below. Derive analytically the transfer function of this hold. Is this data hold physically realizable?



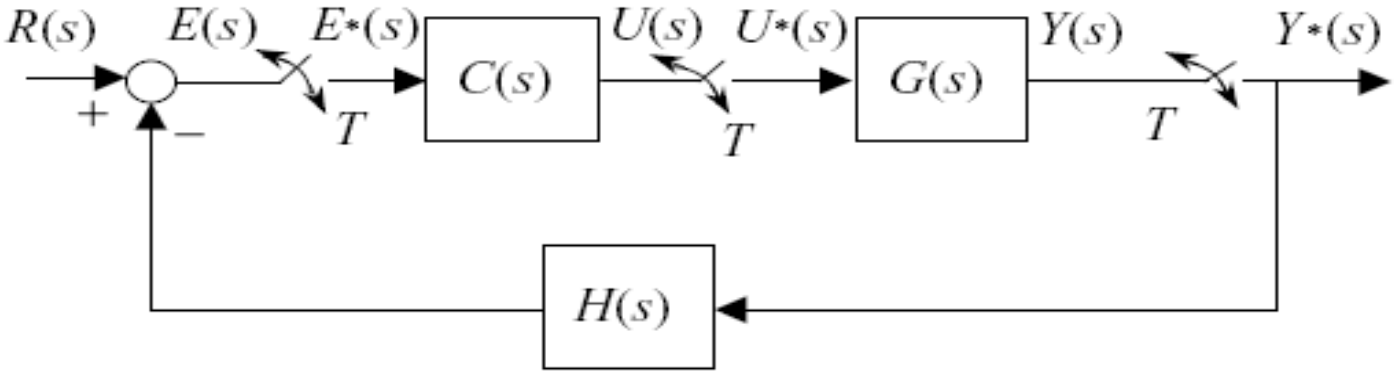
11- Obtain the PTF of the systems shown below.



(a)



(b)



(c)