Q4] A)

$x(t)$ X   C   (1)
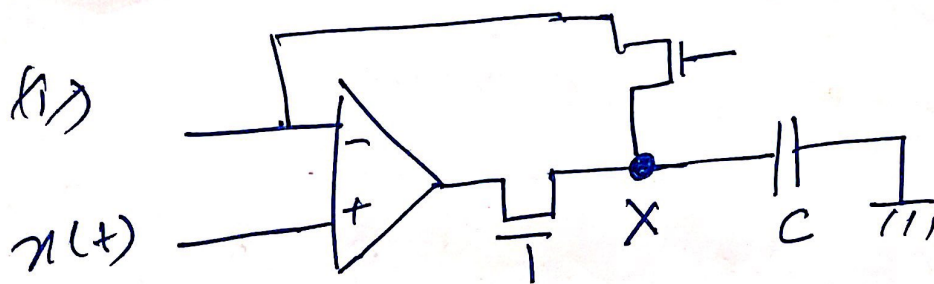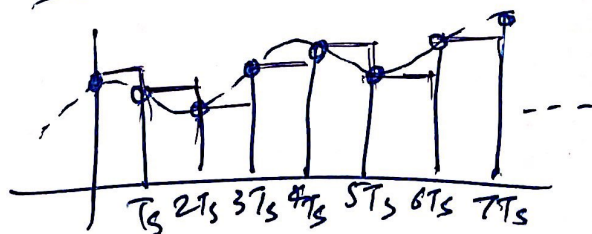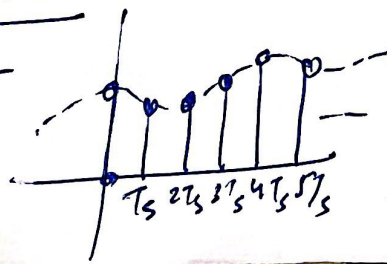
Whenever the MOSFETs are given high ~~vot~~ gate voltage, they will become conducting, and hence the potential at $X = x(\tau)$ where $\tau =$ time when MOSFET is on.

Whenever the MOSFET is switched off, ~~&~~ the capacitor will cause the voltage at X to be held a constant, til the next time that the MOSFET is switched on.

(i) When $T_p << T_s$, we can assume the value of $x(t)$ to be constant in that interval.

∴ The voltage at X will be constant for a duration of T_s and equal to the value $x(nT_s)$. ie. sample & hold.

o/p of ideal samples 1-

on convoluting with Fig4

$T_s \; 2T_s \; 3T_s \; 4T_s \; 5T_s$

$T_s \; 2T_s \; 3T_s \; 4T_s \; 5T_s \; 6T_s \; 7T_s$

(ii) The degradation will be that the capacitor will not hold the value constant. The value will decay with time constant RC.
Basically the sampling will be ideal, but we will convolute with

g

$e^{-\frac{T_s}{RC}}$

0 T_s
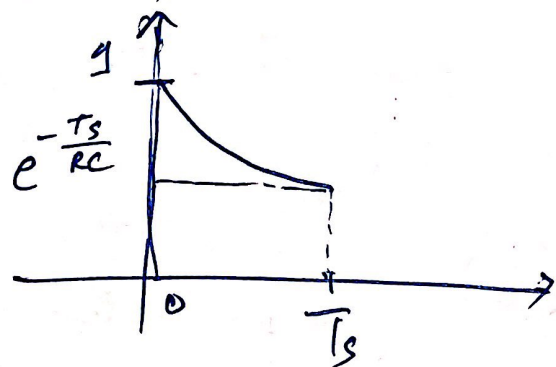
(iii) The voltage at x will follow $x(t)$ til T_p and then hold on for $(T_s - T_p)$.

$x(t)$

0 T_p T_s T_p T_s T_p T_s T_p T_s