

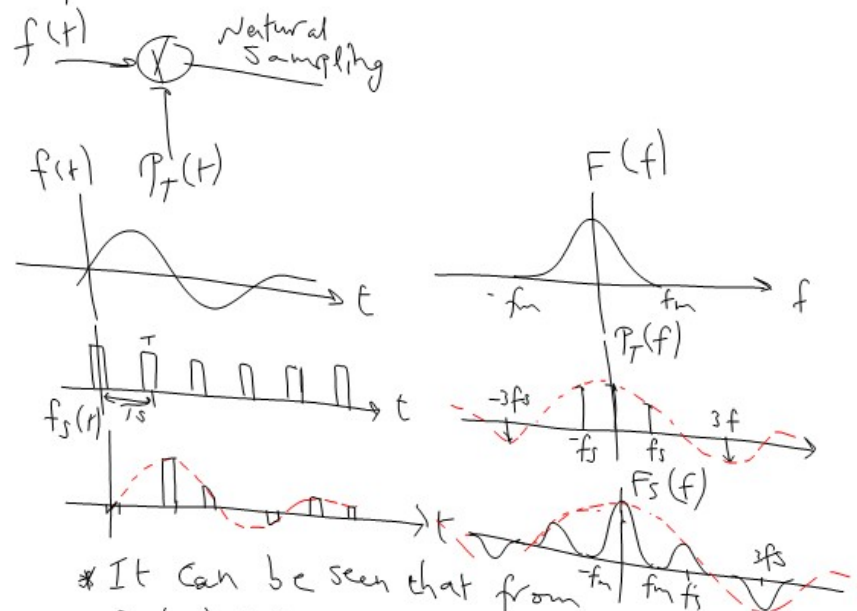
- * In the previous lectures we consider sampling by multiplying the information signal by an ideal train of impulses
- * However in practical circuit the generation of an ideal train of impulses is not possible due to circuit limitations
- * all practical circuits can generate square pulses with finite length duration as shown



- * This fact leads to another two sampling types known as
 - a) natural sampling
 - b) flat top sampling (Pulse amplitude modulation PAM)

Natural Sampling

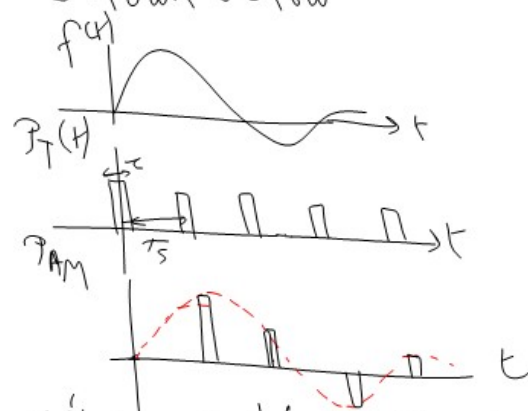
- * In natural sampling the information signal $f(t)$ is multiplied by a periodic pulse train as shown below



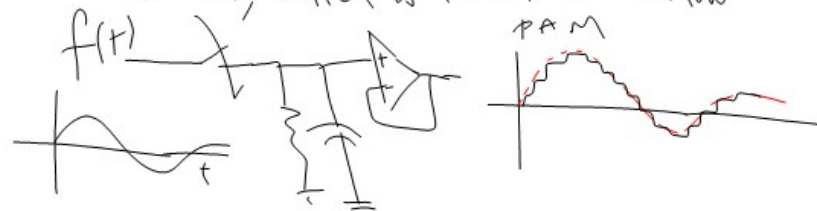
- * It can be seen that from $f_s(f)$ figure that we can reconstruct the continuous time signal by using a LTF

Flat top sampling (PAM)

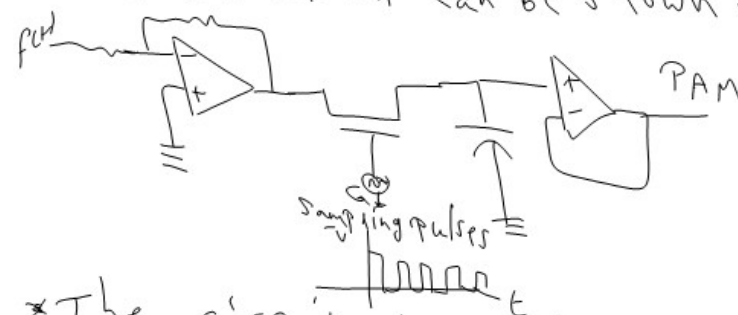
- * In flat top sampling the amplitude of a periodic pulse train is varied according to the amplitude of the message signal as shown below



- * It is possible to recover the continuous time signal from the discrete time pulses by using a Lpf provided that $\tau/T_s < 0.1$
 * Flat top sampling can be generated by a circuit known as sample and hold circuit, which is illustrated below



- * A modified version of the sample and hold circuit can be shown below

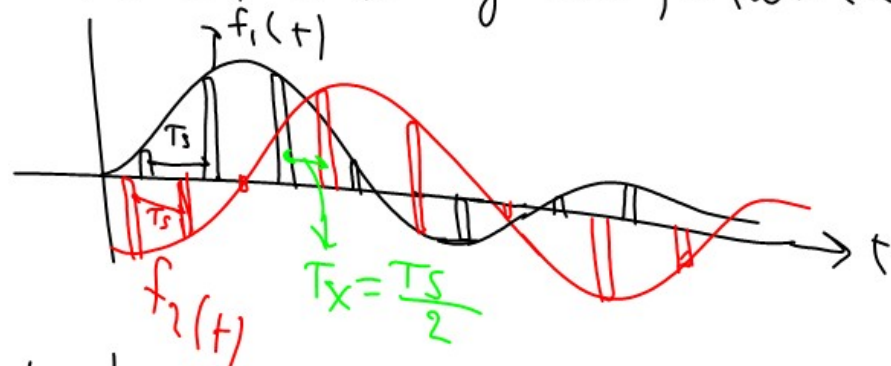


- * The circuit that can be used to generate natural samples is shown below

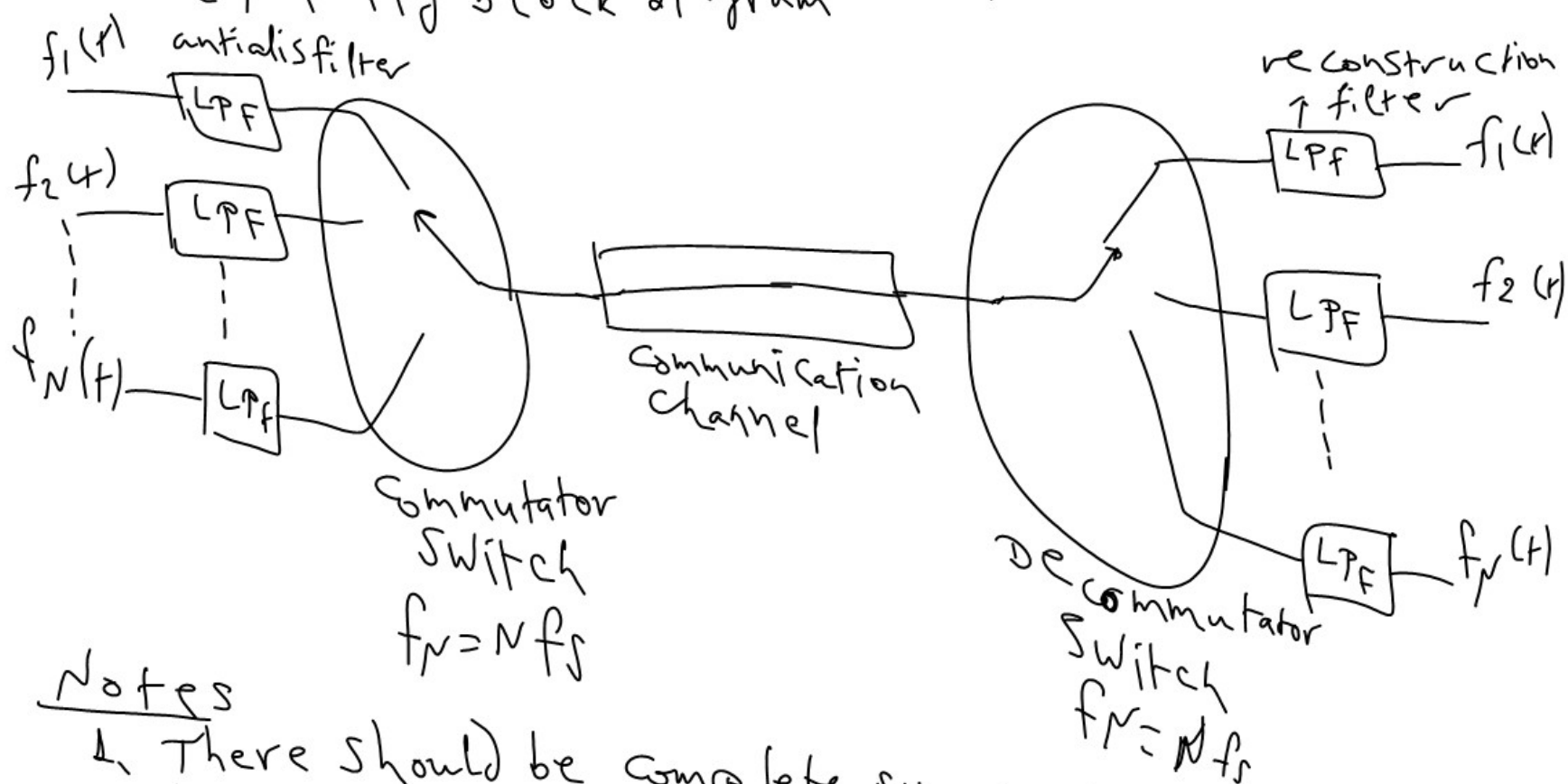


Time Division Multiplexing

* In time division multiplexing the time axis is divided between different users, so that all the users share a common channel simultaneously as illustrated by the following diagram



* The TDM system that accomplishes time division multiplexing can be illustrated by the following block diagram



Notes

1. There should be complete synchronization between the Commutator and decommutator switches
2. The Commutator switch has two tasks
 - a) Sampling
 - b) multiplexing
3. The Commutator switch must operate at a clock rate of

$f_N = Nf_s$
4. The bandwidth required for the transmission of a TDM signal is given by

$BW = \frac{f_N}{2}$