Department of Electronics & Communication Engg.

Course : Signals and Systems Engg-15EC44. Sem.: 4th (2017-18, Even)

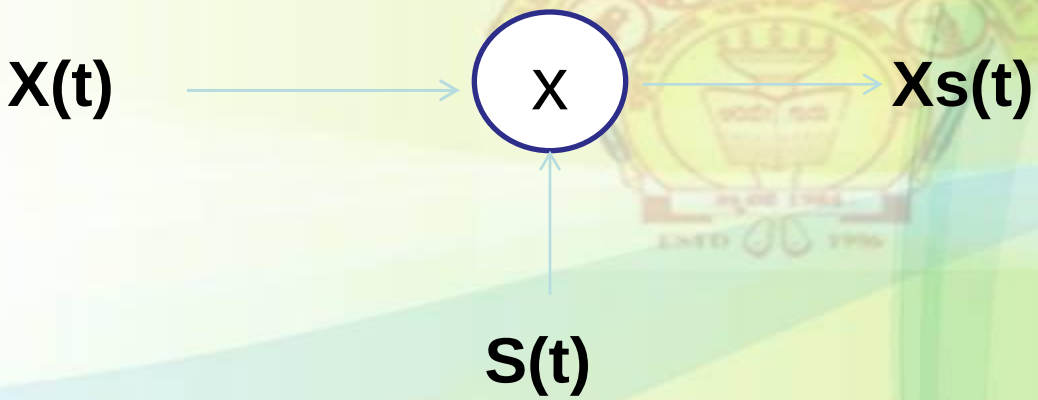
Course Coordinator:

Prof. S. S. Kamate

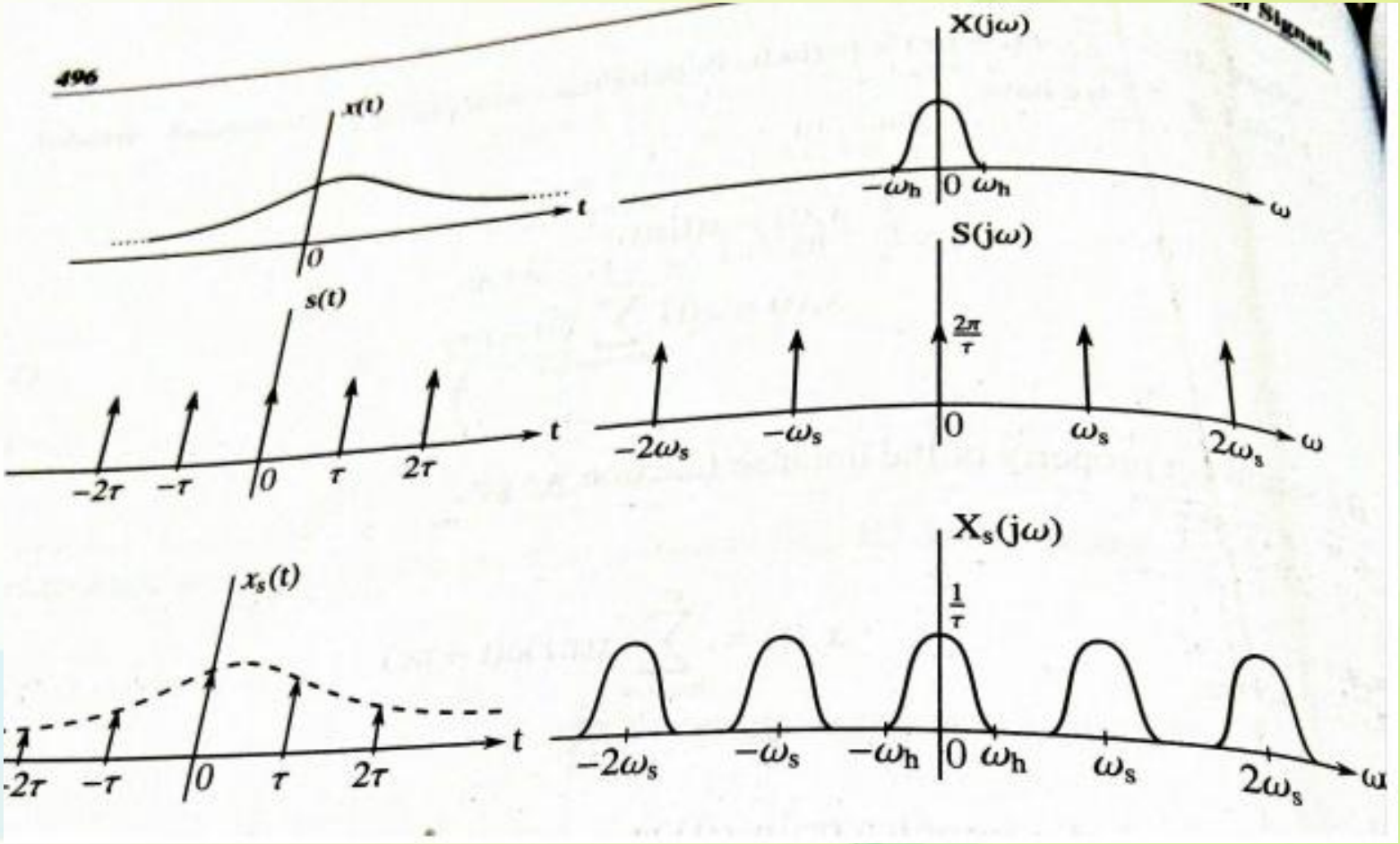
Sampling and Reconstruction

Definition

- The process of converting an analog signal(continuos_time) signal into it's digital form.



Waveforms


496
x(t)
t
0
X(jω)
−ωh
0
ωh
ω
s(t)
−2τ
−τ
0
τ
2τ
t
S(jω)
2π/τ
−2ωs
−ωs
0
ωs
2ωs
ω
xs(t)
−2τ
−τ
0
τ
2τ
t
Xs(jω)
1/τ
−2ωs
−ωs
−ωh
0
ωh
ωs
2ωs
ω

Sampling Theorem

- If x(t) is a band limited signal;

$$X(j\omega) = 0 \; ; \; |\omega| > \omega_h,$$

ω_h is the h, highest frequency the x(t) signal,

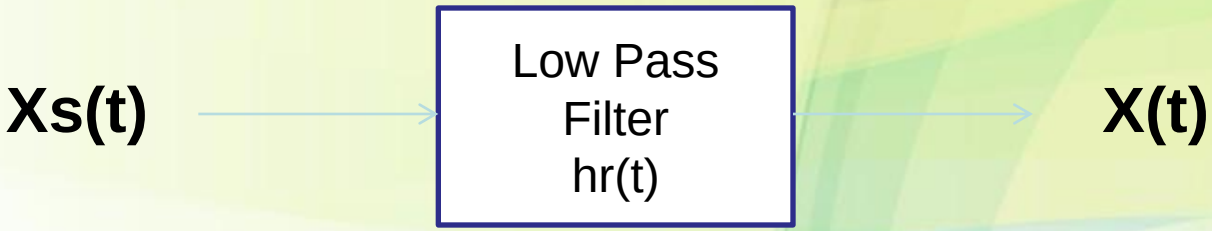
Then x(t) is uniquely determined by samples taken at the rate, ω_s

$$\omega_s = 2\Pi/\tau \geq \omega_h$$

The minimum sampling rate is Nyquist rate is $2\omega_h$, and the Nyquist frequency is $f_s = 2f_h$

Reconstruction

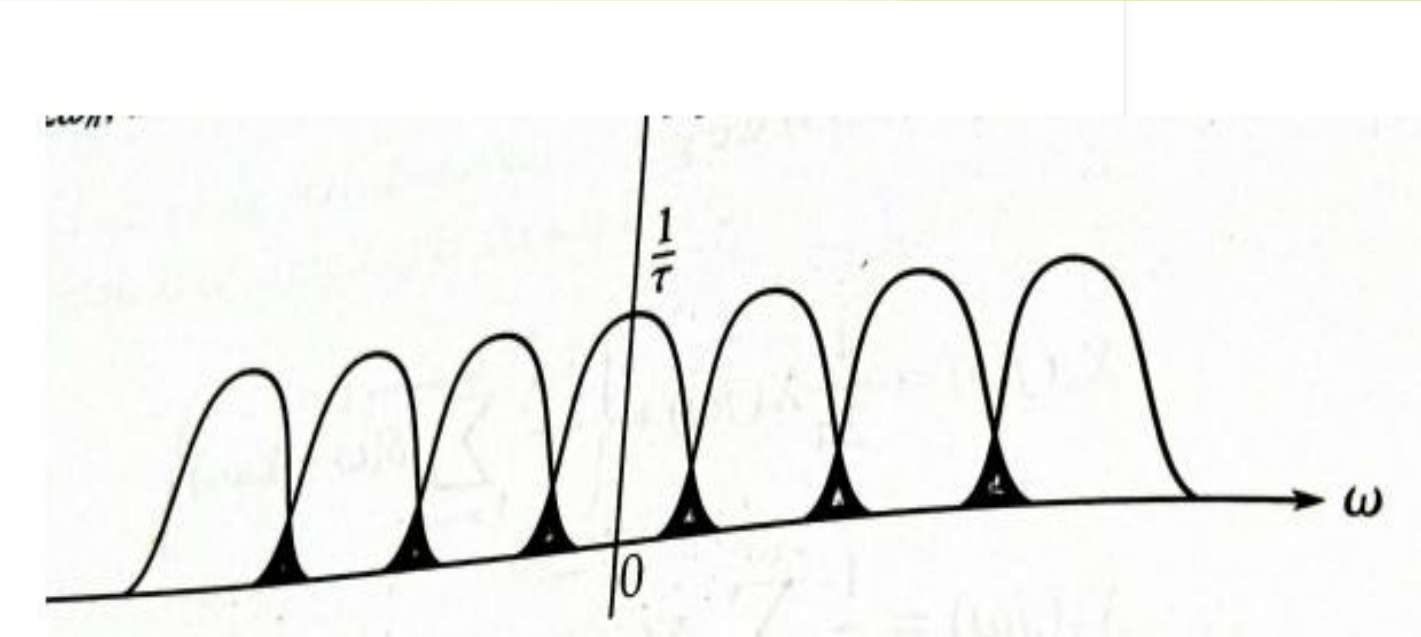
- The process of recovering original signal x(t) from the sampled signal xs(t).



$$x(t) = x_s(t) * h_r(t)$$

Aliasing

If $\omega s = 2\Pi/\tau < \omega h$



Queries ...?