Morning session

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Topic : Signals and system

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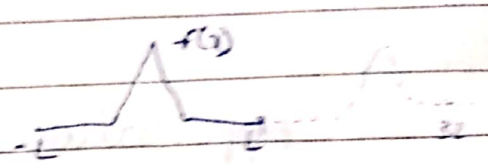
Sem - IV Sem.

Report :

Fourier series & Gib's phenomenon :

Fourier transform

$$f(x) = \sum_{k=-\infty}^{\infty} C_k e^{ik\omega x/L}$$



$$C_k = \frac{1}{2\pi}\langle f(x), \psi_k \rangle = \frac{1}{2L}\int_{-L}^{L} f(x) \underbrace{e^{-ik\omega x/L}}_{\psi_k} dx$$

$$\omega_k = \frac{k\pi}{L} = k\Delta\omega \qquad \therefore \Delta\omega = \frac{\pi}{L}$$

It is periodic

$$f(x) = \lim_{\Delta\omega\to 0} \sum_{k=-\infty}^{\infty} \frac{\Delta\omega}{2\pi} \int_{-\pi/\Delta\omega}^{\pi/\Delta\omega} f(\xi) e^{-ik\Delta\omega\xi} d\xi\, e^{ik\Delta\omega x}$$

$$= \int_{-\infty}^{\infty} \frac{1}{2\pi} \int_{-\infty}^{\infty} f(\xi) e^{-i\omega t} d\xi\, e^{i\omega x} d\omega$$

The fourier Transform Derivative :

$$F\left(\frac{d}{dx} f(x)\right) = \int_{-\infty}^{\infty} \frac{df}{dx} e^{i\omega x} dx$$

$$= f(x) e^{-i\omega x}\Big]_{-\infty}^{\infty} - \int_{-\infty}^{\infty} f(x)(-i\omega e^{i\omega x})\, dx$$

Fourier transform & Convolution

$$(f * g) = \int_{-\infty}^{\infty} f(x-\xi) g(\xi)\, d\xi$$

$F(f * g) = F(f)\,F(g) = \hat{f}\hat{g}$

$f^{-1}(\hat{f}\hat{g})(x) = \frac{1}{2\pi}\int_{-\infty}^{\infty} \hat{f}(w)\,\hat{g}(w)\,e^{iwx}\,dw.$

Fourier laplace Transform:

$F(w) = \int_{-\infty} f(t)\,e^{0-iwt}\,dt.$

Application of Z Transform:

difference equation

It is relation b/w the difference of an unknown function at one / more general values of the argument.

ex: $\Delta y_{n+1} + y_n = 2$

$\Delta y_{n+1} + \Delta^2 y_{n-1} = 1$

$\Delta f(x) = f(x+h) - f(x)$

$\Delta y_{n+1} = y_{n+2} - y_{n+1}$

& $\Delta y_{n+1} + y_n = 2$

Z- Transform using matlab:

```
>> syms n;
>>
fx >> a = n+1;
>>
>> b = ztrans(a);
>> disp(b)
z/(z-1) + z/(z-1)^2
>> pretty b.
```