EE210 – Tut 1 Soln

17 JULY Tuesday

198-167 Week 29

1. Given: $u[n]$ with support N_u
$h[n]$ – – – – – N_h

$$y[n] = u[n] * h[n]$$

(a)
$$T = \underbrace{\begin{bmatrix} h[0] & 0 & \cdots & 0 \\ h[1] & h[0] & \ddots & \vdots \\ \vdots & h[1] & \ddots & 0 \\ h[N_h] & \vdots & \ddots & h[0] \\ 0 & h[N_h] & \ddots & h[1] \\ \vdots & & \ddots & \vdots \\ 0 & \cdots & \cdots & h[N_h] \end{bmatrix}}_{}\ (N_h+N_u+1)\times(N_u+1)$$

(b) $N_y = N_h + N_u + 1$

(c) $Y(z) = U(z) \cdot H(z)$
Support of 'y' depends only on the support of 'h' and 'u'.

2. Support of y is from $(s_u + s_h)$ to $(\cancel{s}\, e_u + e_h)$.

$\therefore$ Support of $y = (e_u - s_u) + (e_h - s_h) + 1$.

3. (a) Show that

$$h * \{a u_1 + b u_2\} = a(h * u_1) + b\,(h * u_2)$$

~~(b)~~ (c) Show that if $h(t) * u(t) = y(t)$
then,

$$h(t) * u(t - t_0) = y(t - t_0).$$

4. $$h[k] = \text{Step}[k] = \begin{cases} 0 & k < 0 \\ 1 & k \geq 0 \end{cases}$$

5. Take functions whose area is 1. The sequence should be such that the width of the f^n's decreases and their heights increase.

7. $y_1(n) = u(n) + u(n-1) \rightarrow$ Low pass filter
$y_2(n) = u(n) - u(n-1) \rightarrow$ High pass filter

~~8. (a) Yes, δ_c is in L^1 space.~~
~~(b)~~

8. (a) No, δ_c is not in L^1
(b) No, δ_c is a distribution
(c) The fourier transforms converge to 1.

9. (a) $F_c \perp\!\!\!\perp f_c$ $\quad$ $F_+ \perp\!\!\!\perp f_+$

$F_c \perp\!\!\!\perp f_+$ $\quad$ $F_- \perp\!\!\!\perp F_-$

$F_c \perp\!\!\!\perp F_-$

$F_c \perp\!\!\!\perp F$