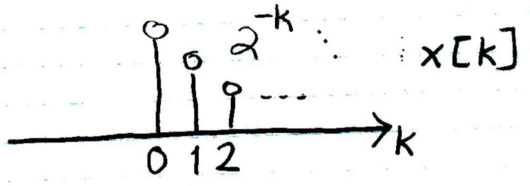
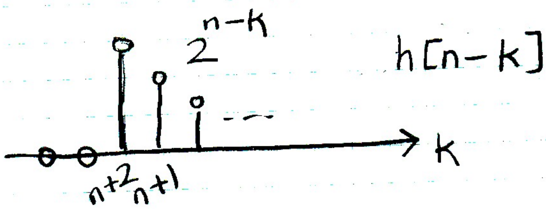
$\boxed{1-20p}$

$$h[n-k] = 2^{n-k}\, u[k-(n+2)]$$





① $n+2 < 0 \rightarrow \boxed{n<-2}$

$$y[n] = \sum_{k=0}^{\infty} 2^{-k} \cdot 2^{n-k} = 2^n \sum_{k=0}^{\infty} 4^{-k}$$

$$= 2^n \frac{1}{1-\frac{1}{4}} = \boxed{\frac{4}{3}\, 2^n}$$

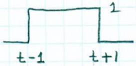
② $\boxed{n \geqslant -2}$

$$y[n] = \sum_{k=n+2}^{\infty} 2^n \cdot 4^{-k} = 2^n \times \frac{(1/4)^{n+2}}{1-1/4}$$

$$= 2^n \cdot 2^{-2n} \cdot \left(\frac{1}{4}\right)^{\cancel{2}} \cdot \frac{\cancel{4}}{3}$$

$$= \boxed{\frac{1}{12} \cdot 2^{-n}}$$

2-20p



① $t+1 < 1 \rightarrow t<0$

$$y(t) = \int_{t-1}^{t+1} e^\tau \, d\tau$$

$$= e^\tau \Big|_{t-1}^{t+1} = e^{t+1} - e^{t-1}$$

② $\left.\begin{matrix} t \geqslant 0 \\ t-1<1 \quad t<2 \end{matrix}\right\}$

$$y(t) = \int_{t-1}^{1} e^\tau \, d\tau = e - e^{t-1}$$

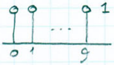
③ $t \geqslant 2 \rightarrow y(t) = 0$

$$\boxed{y(t) = \begin{cases} e^{t+1} - e^{t-1}, & t<0 \\ e - e^{t-1}, & 0 \leqslant t < 2 \\ 0, & t \geqslant 2 \end{cases}}$$

$\boxed{\text{3-a-10p}}$

$$h[n] = \mathcal{H}\{\delta[n]\}$$

$$h[n] = \sum_{k=0}^{9} \delta[n-k] = u[n] - u[n-10]$$



$\boxed{\text{3-b-10p}}$

$$s[n] = \sum_{k=-\infty}^{n} h[k]$$

$$n<0 \rightarrow s[n] = 0$$

$$9 \geq n \geq 0 \rightarrow s[n] = \sum_{k=0}^{n} 1 = n+1$$

$$n>9 \rightarrow s[n] = \sum_{k=0}^{9} 1 = 10$$

$$\boxed{s[n] = \begin{cases} 0, & n<0 \\ n+1, & 0 \leq n \leq 9 \\ 10, & n>9 \end{cases}}$$

4

$\boxed{a-3p}$ not memoryless

$\boxed{b-3p}$ not causal

$\boxed{c-4p}$

$$\sum_{k=-\infty}^{-2} 2^n = 2^{-2}\left(\frac{-2}{-2-1}\right) = \frac{2}{3}\cdot 0.25$$
$$= \underline{0.1667} < \infty$$

$\boxed{\text{stable}}$

5

a-3p not memoryless

b-3p not causal

c-4p $\int_{-1}^{+1} 1 \, dz = 2 < \infty$ stable

6a 10p Superposition

$$x_1[n] + x_2[n] \xrightarrow{\mathcal{H}} e^{-3n}(x_1[n] + x_2[n])u[n]$$
$$= \underbrace{e^{-3n}x_1[n]u[n]}_{y_1[n]} + \underbrace{e^{-3n}x_2[n]u[n]}_{y_2[n]}$$

Homogenity $\alpha\, x[n] \xrightarrow{\mathcal{H}} e^{-3n}\alpha \cdot x[n]u[n] = a\, y[n]$

$\therefore$ Linear

6b-10p

$$x[n-n_0] \rightarrow e^{-3n}x[n-n_0]u[n]$$
$$\neq e^{-3(n-n_0)}x[n-n_0]u[n-n_0]$$

$\therefore$ not TI