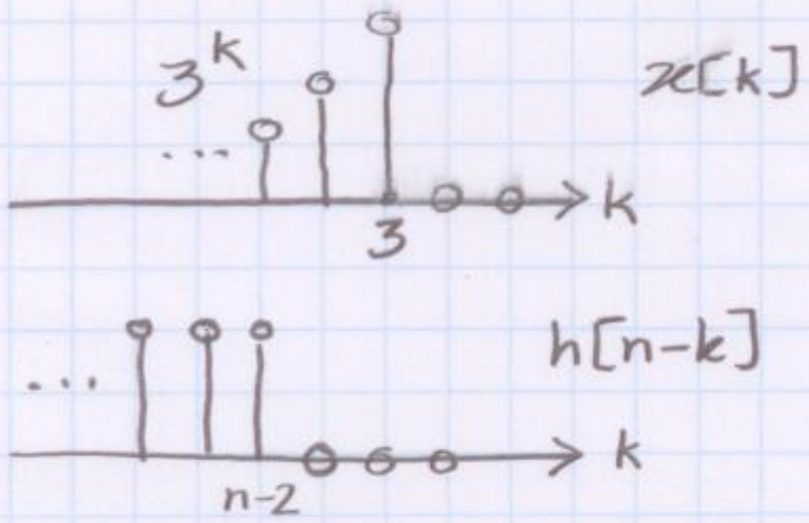
Signal Processing İ.Ö. 2016 Final Çözümleri

① (25p)



• For $n-2 \leq 3 \rightarrow n \leq 5$

$$y[n] = \sum_{k=-\infty}^{n-2} 3^k$$

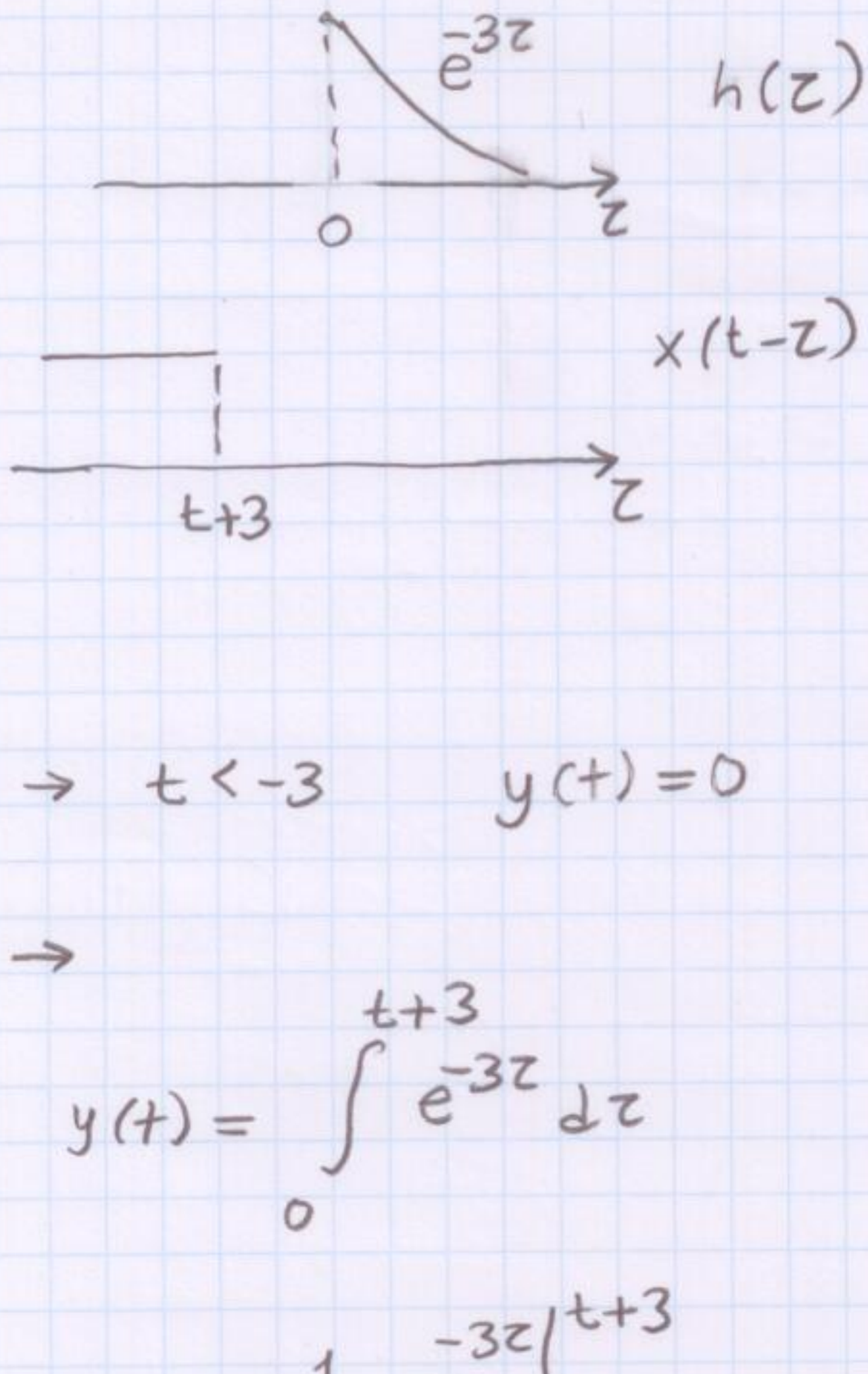
$$= 3^{n-2} \frac{3}{3-1}$$

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

• For $n > 5$ $\quad y[n] = \sum_{k=-\infty}^{3} 3^k = 3^3 \cdot \frac{3}{3-1} = \frac{1}{2} 3^4 = 81$

$$y[n] = \begin{cases} \frac{3^{n-1}}{2}, & n \leq 5 \\ 81, & n > 5 \end{cases}$$

(2) [25p]



- $t+3<0 \rightarrow t<-3 \qquad y(t)=0$

- $t \geq -3 \rightarrow$

$$y(t)=\int_0^{t+3} e^{-3\tau}\,d\tau$$

$$=\frac{-1}{3}\, e^{-3\tau}\Big|_0^{t+3}$$

$$=\frac{1}{3}\left(1-e^{-3(t+3)}\right)$$

$$y(t)=\begin{cases} 0 \;, & t<-3 \\ \frac{1}{3}\left[1-e^{-3(t+3)}\right] \;, & t\geq -3 \end{cases}$$

③ a) 15 p

$$h(t) = \delta(t-3) + \int_{-\infty}^{t} \delta(\tau+1)\, d\tau$$

$$\boxed{h(t) = \delta(t-3) + u(t+1)}$$

b) 15 p

$$s(t) = \int_{-\infty}^{t} \delta(\tau-3)\, d\tau + \int_{-\infty}^{t} u(\tau+1)\, d\tau$$

$$\boxed{s(t) = u(t+3) + t\, u(t+1)}$$

---

④ a) 3 Causal because $h[n] = 0$ for $n < 0$

b) 3 Not memoryless because $h[n] \neq 0$ for $n \neq 0$

c) 4 $\sum_{k=2}^{\infty} 1 = \infty$ ∴ not stable

---

⑤ a) 3 Causal because $h[t] = 0$ for $t < 0$

b) 3 Not memoryless because $h[t] \neq 0$ for $t \neq 0$

c) 4 $\int_{0}^{\infty} e^{-3\tau}\, d\tau = \frac{1}{3} < \infty$ ∴ stable