Correction DS ASN 1 Avril 2019 (/23 pts)

Exercice 1: (9 pts) (2 pts / questions)

1. ① Filtre anti-repliement => mise en place d'un filtre passe-bas de fréquence de coupure 210 Hz

② Echantillonage => application du théorème de Shannon.

$F_e \geq 2 \times 210\,Hz$

$F_e \geq 420\,Hz$

③ Quantification + codage binaire:

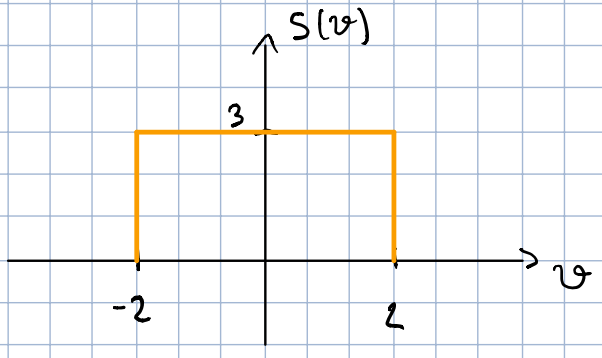
- $e_{max} = 0{,}05$ Volts
- q = pas de quantification = $\frac{\text{dynamique}}{2^n} = \frac{6}{2^n}$

troncature	arrondi
$e_{max} = q$	$e_{max} = \frac{q}{2}$
$0{,}05 = \frac{6}{2^n}$	$0{,}05 = \frac{6}{2^n} \times \frac{1}{2}$
$2^n = 120$	$2^n = 60$
$n = 7$ bits	$n = 6$ bits

=> étant donné le critère "moins de bits possible", on choisit l'arrondi.

Exercice 2 : (14 pts ~) (2 pts / question)

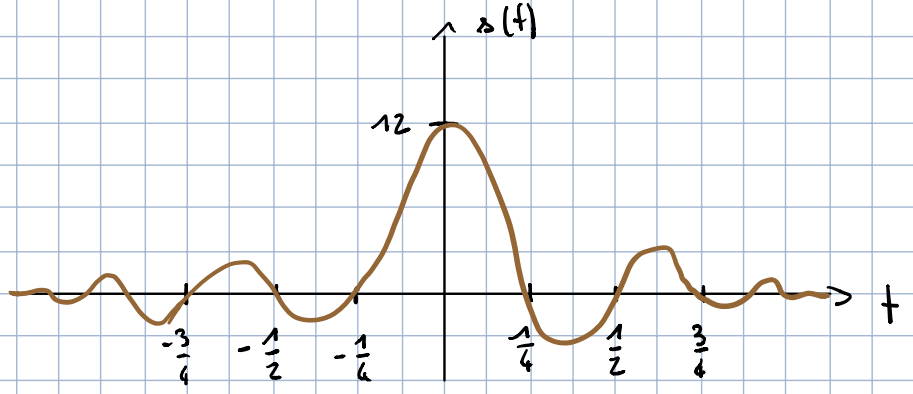
1.



$$s(t) = \int_{-\infty}^{+\infty} S(\nu)\, e^{2i\pi\nu t}\, d\nu = \int_{-2}^{+2} 3\, e^{2i\pi\nu t}\, d\nu$$

$$= \frac{3}{2i\pi t}\left[e^{2i\pi\nu t}\right]_{-2}^{+2} = \frac{3}{2i\pi t}\left[e^{+4i\pi t} - e^{-4i\pi t}\right]$$

$$= 3\times 4\left[\frac{e^{4i\pi t} - e^{-4i\pi t}}{2i \times 4\pi t}\right] = 12\ \mathrm{sinc}\,(4\pi t)$$



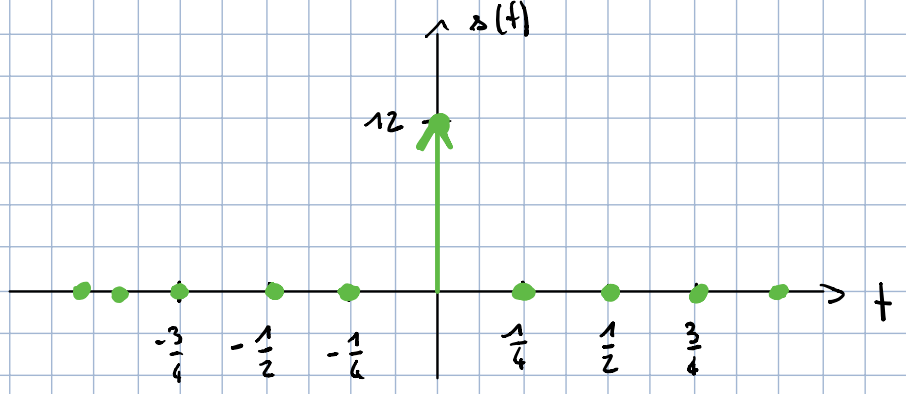
2- • $E = \int_{-\infty}^{+\infty} |s(t)|^2 \, dt$ (trop compliqué d'integrer)

↳ on utilise le théorème de perceval

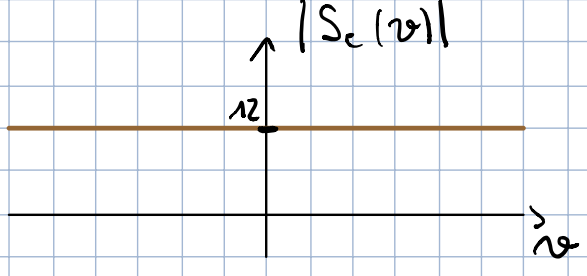
• $E = \int_{-\infty}^{+\infty} |S(\nu)|^2 \, d\nu$

$= \int_{-2}^{2} |S(\nu)|^2 \, d\nu = 36\,J$

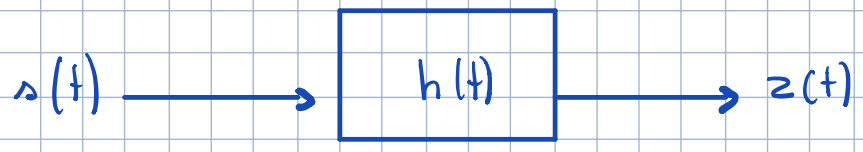
3- a. $T_e = \frac{1}{4}\,s$ (periode d'echantillonage)



6- $S_e(t) = 12\,\delta(t) \xrightarrow{TF} S_e(\nu) = 12$



4-



$$z(t) = s(t) * h(t)$$

dans le formulaire

$$z(\nu) = S(\nu) \cdot H(\nu) = S(\nu) \cdot a\, e^{-2i\pi\nu t_0}$$