Sys 1

12% 1. In Abb.1 ist der zeitliche Verlauf des Signals *z(t)* dargestellt. **alt Klausur**

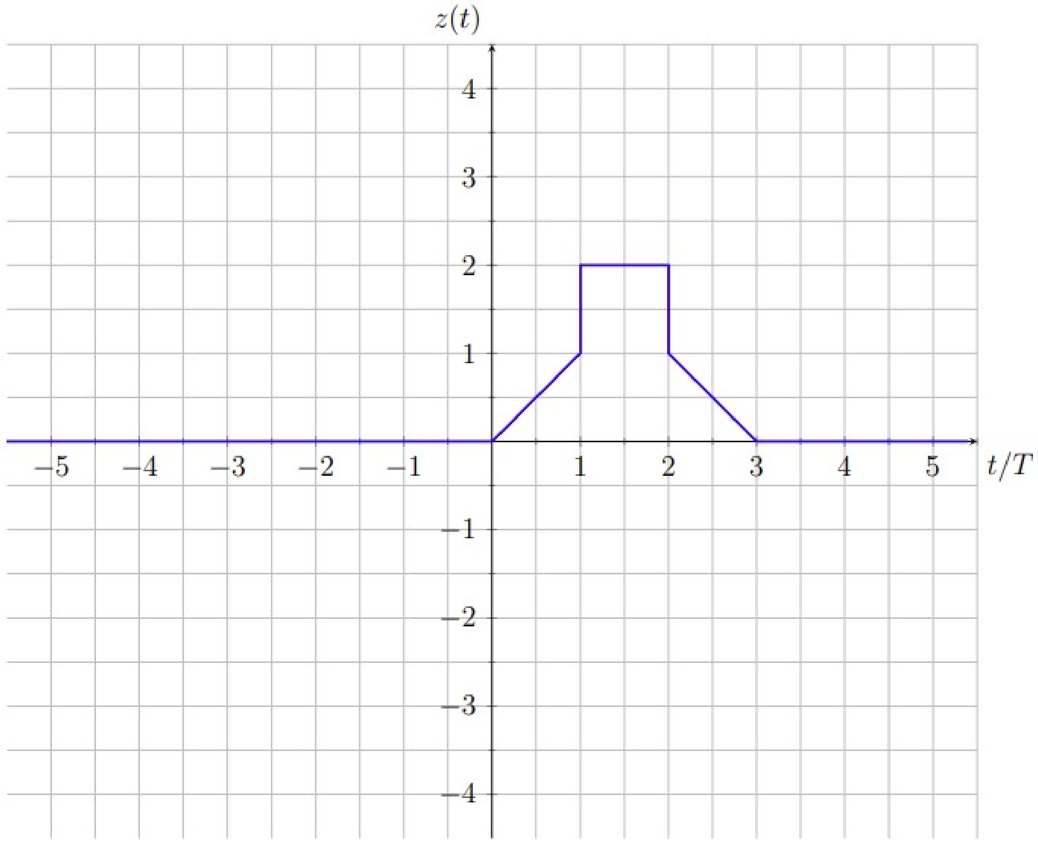


Bild 1: Signalverlauf $z(t)$

Abbildung 1: Signalverlauf z(t)

(a) Bestimmen Sie die abschnittweise Definition von *z(t)*

(b) Berechnen Sie die Energie des Signals *z(t)*. Handelt es sich hierbei um ein Energie- oder Leistungsignal ?

(c) Bestimmen Sie für das in Bild 2 dargestellte System S das Ausgangssignal *y(t)* in Abhängigkeit des Eingangssignal *x(t)*.

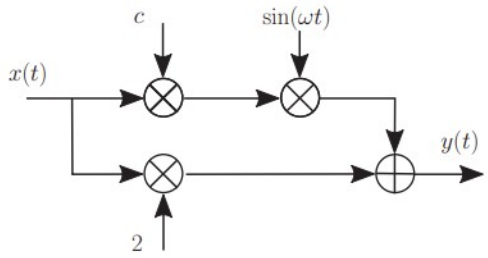


Abbildung 2: Blockdiagram

12% 2. Summe Berechnen

$$\sum_{n=1}^{\infty}\left(\frac{1}{3}\right)^{n}$$

(a) $\sum_{n=0}^{9} e^{j\pi n/2}$ **(b)** $\sum_{n=-2}^{7} e^{j\pi n/2}$

(c) $\sum_{n=0}^{\infty} (\frac{1}{2})^n e^{j\pi n/2}$ **(d)** $\sum_{n=2}^{\infty} (\frac{1}{2})^n e^{j\pi n/2}$

(e) $\sum_{n=0}^{9} \cos(\frac{\pi}{2} n)$ **(f)** $\sum_{n=0}^{\infty} (\frac{1}{2})^n \cos(\frac{\pi}{2} n)$

Abbildung 3: Summe Berechnen

12% 3. Integrale Berechnen

(a) $\int_0^4 e^{j\pi t/2} dt$ **(b)** $\int_0^6 e^{j\pi t/2} dt$

(c) $\int_2^8 e^{j\pi t/2} dt$ **(d)** $\int_0^{\infty} e^{-(1+j)t} dt$

(e) $\int_0^{\infty} e^{-t} \cos(t) dt$ **(f)** $\int_0^{\infty} e^{-2t} \sin(3t) dt$

Abbildung 4: Integrale Berechnen

Info2

Boolsche Algebra Übungen (quelle:`ocw.mit.edu`)

1) $a+0=$ ______
2) $\overline{a}\cdot 0=$ ______
3) $a+\overline{a}=$ ______
4) $a+a=$ ______
5) $a+ab=$ ______
6) $a+\overline{a}b=$ ______
7) $a(\overline{a}+b)=$ ______
8) $ab+\overline{a}b=$ ______
9) $(\overline{a}+\overline{b})(\overline{a}+b)=$ ______
10) $a(a+b+c+\ldots)=$ ______

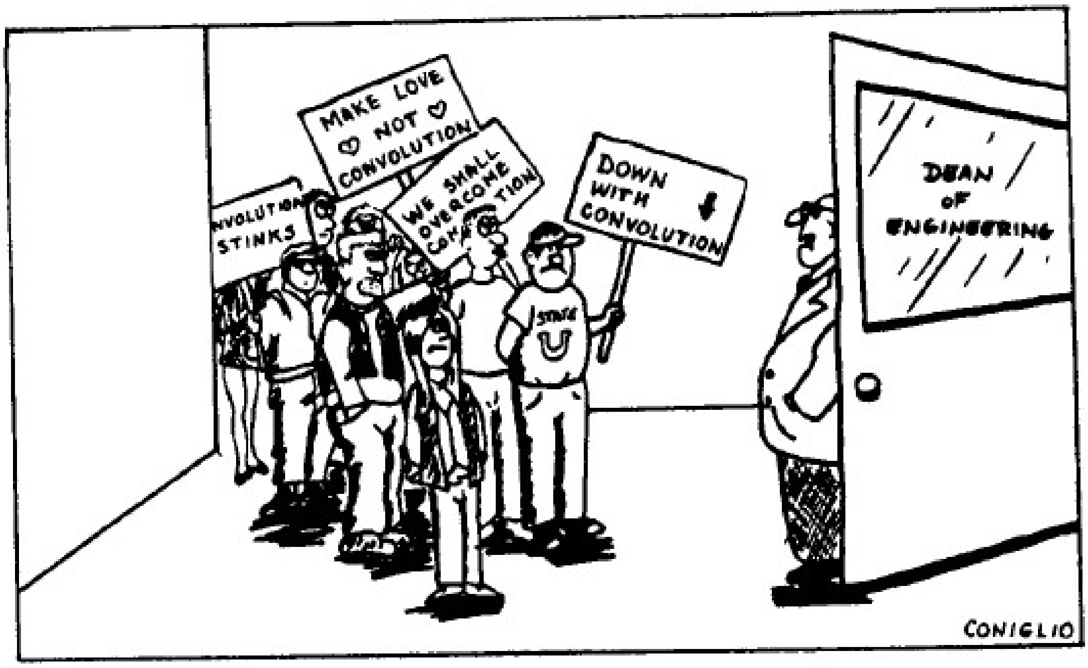
For (11),(12), (13), $f(a,b,c)=a+b+c$

11) $f(a,b,ab)=$ ______
12) $f(a,b,\overline{a}\cdot\overline{b})=$ ______
13) $f[a,b,\overline{(ab)}]=$ ______
14) $y+y\overline{y}=$ ______
15) $xy+x\overline{y}=$ ______
16) $\overline{x}+y\overline{x}=$ ______
17) $(w+\overline{x}+y+\overline{z})y=$ ______
18) $(x+\overline{y})(x+y)=$ ______
19) $w+[w+(wx)]=$ ______
20) $x[x+(xy)]=$ ______
21) $\overline{(\overline{x}+\overline{x})}=$ ______
22) $\overline{(x+\overline{x})}=$ ______
23) $w+(w\overline{x}yz)=$ ______
24) $\overline{w}\cdot\overline{(wxyz)}=$ ______
25) $xz+\overline{x}y+zy=$ ______
26) $(x+z)(\overline{x}+y)(z+y)=$ ______
27) $\overline{x}+\overline{y}+xy\overline{z}=$ ______

Summary of the Graphical Procedure

The procedure for graphical convolution can be summarized as follows:

1. Keep the function $f(\tau)$ fixed.
2. Visualize the function $g(\tau)$ as a rigid wire frame, and rotate (or invert) this frame about the vertical axis ($\tau = 0$) to obtain $g(-\tau)$.
3. Shift the inverted frame along the τ axis by t_0 seconds. The shifted frame now represents $g(t_0 - \tau)$.
4. The area under the product of $f(\tau)$ and $g(t_0 - \tau)$ (the shifted frame) is $c(t_0)$, the value of the convolution at $t = t_0$.
5. Repeat this procedure, shifting the frame by different values (positive and negative) to obtain $c(t)$ for all values of t.



Convolution: its bark is worse than its bite!

The graphical procedure discussed here appears very complicated and discouraging at first reading. Indeed, some people claim that convolution has driven many electrical engineering undergraduates to contemplate theology either for salvation or as an alternative career (*IEEE Spectrum*, March 1991, p.60). Actually, the bark

Abbildung 5: