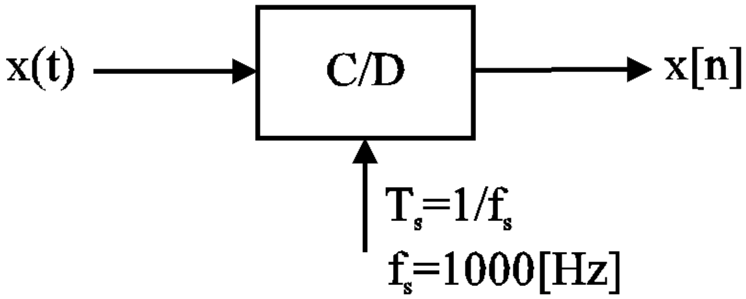
Opg 4.7

a)



Det kontinuerte signal har formen:

$$x(t) = A\cos(2\pi f t + \phi)$$

$$x[n] = x(nT_s) = A\cos(2\pi f nT_s + \phi) = A\cos(2\pi \hat{f} n + \phi)$$

Givet: $x[n] = 10\cos(0.2\pi n - \frac{\pi}{7}) = 10\cos(2\pi \frac{1}{10} n - \frac{\pi}{7})$

Heraf fås: $A = 10$, $\phi = -\frac{\pi}{7}$ og $\hat{f} = 0.1$

Vi regner nu kun med rigtige frekvenser, dvs. $f > 0$.

1) $\hat{f}_1 = \frac{f_1}{f_s} = 0.1 \quad \Rightarrow \quad f_1 = 0.1 f_s = 0.1 \cdot 1000 = 100[Hz]$

$\Rightarrow \quad \underline{x_1(t) = 10\cos(2\pi 100 t - \frac{\pi}{7})}$

2) Alle mulige aliasfrekvenser: $f = \pm f_0 + l f_s \qquad l \in Z$

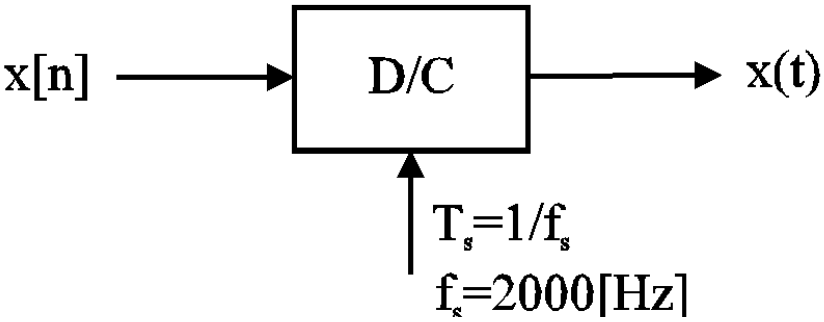
Hvis $0 \le f \le 1000$ bliver der kun foldningsmuligheden med $l = 1$.

$f_2 = -f_0 + 1 f_s = -100 + 1000 = 900[Hz]$

$\Rightarrow \quad \underline{x_2(t) = 10\cos(2\pi 900 t + \frac{\pi}{7})}$ jvf. p.89

Dette svarer til undersampling: $f_2 > \frac{f_s}{2}$.

b)



$f = \hat{f} \cdot f_s = 0.1 \cdot 2000 = 200[Hz]$

Signalet, der gendannes, bliver:

$\underline{x_2(t) = 10\cos(2\pi 200 t - \frac{\pi}{7})}$

NB! Signal 2) svarer nu til en $f_2 = 1800[Hz]$. Dette signal rekonstrueres ikke, da $1800 > \frac{2000}{2} = 1000$.