1. Given a product filter $0.4\,z + 1 + 0.4\,z^{-1}$, determine corresponding filters $H(z)$ and $G(z)$ in an orthogonal filter bank. (6 p)

2. Given two sequences of finite length N, show that their periodic convolution corresponds to pointwise multiplication of their Fourier transforms (and possibly a scaling). (6 p)

3. Determine the Fourier transform of the function $f(x, y) = xy\,e^{-\pi(x^2+y^2)}$ in R^2. (6 p)

4. Determine the Fourier transform of $f(x) = (H(x)\,x)^{-1/2}$, where H is the Heaviside function. (7 p)

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