

*Hjälpmedel:* Kurslitteratur, anteckningar och valfri räknare.

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1. Determine the Fourier transform of the 2 by 2 periodic sequence  $x_{00} = x_{10} = x_{01} = 0$  &  $x_{11} = 1$ . (6 p)

2. Determine the Fourier transform of the function  $f(x) = |x|^{-\alpha}$  ( $x \in \mathbb{R}^n$  &  $0 < \alpha < n$ ). The transform may be given with a constant factor in the form of an integral. (6 p)

3. Given an orthogonal MRA, the corresponding low-pass  $2\pi$ -periodic filter function  $H$ , and the equation  $H(\omega)G(\omega)^* + H(\omega + \pi)G(\omega + \pi)^* = 0$ , where  $G$  also has period  $2\pi$ . Show that this implies  $G(\omega) = K(\omega)H(\omega + \pi)^*$ , for some  $2\pi$ -periodic  $K$  with  $K(\omega + \pi) = -K(\omega)$ . (6 p)

4. Determine the Fourier transform of the function  $f(x) = (1 + e^{2\pi i x})^{-1}$ . (7 p)