정보통신 수학 및 실습
Homework

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Chapter 12 Homework

1. Find the DTFT of the following functions.

a) $x[n] = 0.5^n u[n]$

$$F(w) = \sum_{k=-\infty}^{\infty} x[k]e^{-jwk} = \sum_{k=0}^{\infty} 0.5^k e^{-jwk}$$

b) $x[n] = -0.5^n u[n]$

$$F(w) = \sum_{k=-\infty}^{\infty} x[k]e^{-jwk} = \sum_{k=0}^{\infty} (-0.5)^k e^{-jwk}$$

c) $x[n] = 1, |n| \leqq 2$

$$F(w) = \sum_{k=-\infty}^{\infty} x[k]e^{-jwk} = \sum_{k=-2}^{2} e^{-jwk} = \frac{e^{2jw}(1 - e^{-j5w})}{1 - e^{-jw}}$$

d) $x[n] = \cos(\omega_0 n + \phi)$

$$F(w) = \sum_{k=-\infty}^{\infty} x[k]e^{-jwk} = \sum_{k=-\infty}^{\infty} \cos(w_0 k + \phi)e^{-jwk} = \sum_{k=-\infty}^{\infty} \frac{1}{2}(e^{w_0 k + \phi} + e^{-w_0 k - \phi})e^{-jwk}$$

e) $x[n] = \sin(\omega_0 n)$

$$F(w) = \sum_{k=-\infty}^{\infty} x[k]e^{-jwk} = \sum_{k=-\infty}^{\infty} \sin(w_0 k)e^{-jwk} = \sum_{k=-\infty}^{\infty} \frac{-j}{2}(e^{w_0 k} - e^{-w_0 k})e^{-jwk}$$