

Department of Electronics & Communication Engineering
Indian Institute of Technology Roorkee

EC 203 – Signals & Systems (DG)

TUTORIAL #3

1. Find the DTFS representation for the sequence

$$x_p[n] = \sum_{k=-\infty}^{+\infty} x[n - 10k]$$

where

$$x[n] = \begin{cases} 1, & \text{for } 0 \leq n \leq 5 \\ 0, & \text{otherwise} \end{cases}$$

2. Let $x(t)$ be a periodic continuous-time signal

$$x(t) = A \cos(200\pi t) + B \cos(500\pi t)$$

that is sampled at a rate 1 kHz. Find the DTFS coefficients of the sampled signal.

3. Compute the N -point DFT of the following sequences:

(a) $x[n] = \alpha^n, \quad 0 \leq n < N$

(b) $x[n] = u[n] - u[n - n_0], \quad \text{where } 0 < n_0 < N$

4. Find the 10-point inverse DFT of

$$X[k] = \begin{cases} 3, & k = 0 \\ 1, & 1 \leq k \leq 9 \end{cases}$$

5. Consider the sequence $x[n] = 4\delta[n] + 3\delta[n - 1] + 2\delta[n - 2] + \delta[n - 3]$. Let $X[k]$ be the 6-point DFT of $x[n]$.

(a) Find the finite length sequence $z[n]$ that has a 6-point DFT $Z[k] = \text{Re}\{X[k]\}$

(b) Find the finite length sequence $q[n]$ that has a 3-point DFT $Q[k] = X[2k], \quad k = 0, 1, 2$

6. Suppose that we are given a program to find the DFT of a complex-valued sequence $x[n]$. How can this program be used to find the inverse DFT of $X[k]$?
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