

ECEN220 Tutorial 4 Questions

Block 4: Fourier Transform – conceptual and analytical questions

- Q1. Derive the Fourier Transform expression for $x(t)\cos(\omega_0 t)$.
- Q2. What is a sinc function and what are its primary properties? Why is $\text{sinc}(0) = 1$?
- Q3. What is the functional form of the Fourier Transform $X(\omega)$ of a rectangular pulse of amplitude A and duration τ ?
- Q4. What is the Fourier Transform of a DC voltage?
- Q5. For a single rectangular pulse of width τ , what is the spacing $\Delta\omega$ between the first nulls? If τ is very wide, will its frequency spectrum be narrow and peaked or wide and gentle?
- Q6. Use the properties of Fourier Transform to determine the Fourier Transform of $u(-t)$.
- Q7. Verify this Fourier Transform expression $x(t) \cos \omega_0 t \longleftrightarrow \frac{1}{2}[X(\omega - \omega_0) + X(\omega + \omega_0)]$
- Q8. Compute the discrete-time Fourier Transform (DTFT) of $4\cos(0.15\pi n + 1)$.
- Q9. Compute the inverse DTFT of $4\cos(2\Omega) + 6\cos(\Omega) + j8\sin(2\Omega) + j2\sin(\Omega)$.
- Q10. Compute the 4-point DFT of $\{4, 3, 2, 1\}$.
- Q11. Name one major difference between DTFS and CTFS.
- Q12. What is the difference between DTFT and CTFT?
- Q13. What is the significant difference between discrete-time and continuous-time sinc functions?
- Q14. What is the difference between DFT and DTFS?
- Q15. How is the DFT related to the DTFT?