EE320 Signals and Systems I

Chapter 1 Study Guide

In order to do well on a test covering Chapter 1 material, you should be able to:

1. Express and manipulate expressions involving complex-valued variables in both polar and rectangular form.
2. Define and describe a *continuous-time* (CT) *signal*. Define and describe a *discrete-time* (DT) *signal*, and be able to explain the key differences between and a CT and DT signals.
3. Given a mathematical description of a CT signal $x(t)$, sketch $x(t)$. Given a mathematical description of a DT signal $x[n]$, sketch $x[n]$.
4. Given a CT or DT signal, compute the power P and energy E within a given time interval. Compute the average power P_∞ and total energy E_∞ for the given CT or DT signal.
5. Recognize signals which are characterized as *energy signals*, those which are characterized as *power signals*, and those which are neither.
6. Recognize signals which are characterized as *even signals*, those which are characterized as *odd signals*, those which are neither even nor odd, and which signal is both even and odd.
7. Given and expression or plot of a signal, sketch the even part $x_{\text{even}}(t)$ and odd part $x_{\text{odd}}(t)$.
8. Given a signal, recognize if the signal is characterized as a *bounded signal*.
9. Given a mathematical description or sketch of a CT or DT signal, sketch basic signal transformations, including time-reversal, time-shift, time-scaling, amplitude-scaling, DC biasing, and combinations thereof.
10. Given a CT or DT signal, recognize whether the signal is characterized as a *periodic signal*. Determine the *fundamental period* for a periodic signal. Determine the *fundamental frequency* of a periodic signal.
11. Describe in your own words what is meant by a periodic signal.
12. Recognize and manipulate expressions involving CT or DT *complex exponential signals*. Sketch CT or DT complex exponential signals.
13. Determine periodicity and fundamental period/frequency for CT or DT complex exponential signals.
14. Explain in your own words why a DT complex exponential signal may not be (1) unique, (2) increasing in oscillation rate as the frequency increases, (3) periodic.
15. Define and manipulate expressions involving the CT and DT *unit impulse* and *unit step* functions.
16. Explain the *sampling property* and *sifting property* of the unit impulse.
17. Given an input-output equation for a CT or DT system, prove whether the system has the properties of (1) *Memoryless*, (2) *Causality*, (3) *Stability*, (4) *Time-Invariance*, (5) *Linearity*.
18. Describe in your own words why we care about the properties of (1) Memoryless, (2) Causality, (3) Stability, (4) Time-Invariance, (5) Linearity.