

EECS 361- Fall 2023  
Test 1 Topics

- 1) Complex numbers
- 2) Classification of signals
  - a) Periodic
  - b) Aperiodic
  - c) Energy
  - d) Power
  - e) Continuous time
  - f) Discrete time
  - g) Deterministic
  - h) Random
- 3) Time scaling,  $x(at)$ , and time shifting  $x(t \pm T)$  signals
- 4) Phasor representation of  $\cos(2\pi f_0 t)$  & Spectral plots for  $A\cos(\omega_0 t + \phi)$  or  $A\cos(2\pi f_0 t + \phi)$  and  $\sum A_n \cos(2\pi n f_0 t + \phi_n) = \sum A_n \cos(2\pi n \omega_0 t + \phi_n)$
- 5) Calculation of the Energy and Power of Signals & Power in  $A\cos(\omega_0 t + \phi)$  or  $A\cos(2\pi f_0 t + \phi)$
- 6) Special functions
  - a)  $\delta(t)$
  - b)  $\text{tri}(t)$
  - c)  $u(t)$
  - d)  $\text{rect}(t)$
- 7) Classification of Systems
  - a) Linear/Nonlinear
  - b) Time Varying/Time invariant
  - c) Causal/Noncausal
  - d) Continuous time/ Discrete time
  - e) BIBO stable
  - f) Linear Time Invariant (LTI) System
- 8) Convolution & its properties in continuous time
- 9) Impulse response  $h(t)$
- 10) Step response  $a(t)$
- 11) Impulse response of cascaded linear time invariant systems
- 12) Bounded input/Bounded output (BIBO) stability and the impulse response -  $h(t)$
- 13) Causality and the impulse response -  $h(t)$
- 14) Transfer Function of linear time invariant systems –  $H(\omega)$  or  $H(f)$
- 15) Response of a linear time invariant systems with Transfer Function  $H(\omega)$  or  $H(f)$  to an input signal of  $A\cos(\omega_0 t + \phi)$  or  $A\cos(2\pi f_0 t + \phi)$
- 16) Model periodic signals using Fourier Series
  - a) Complex exponential form,  $x_n$ 's
  - b) Sine/Cosine form,  $a_n$ 's and  $b_n$ 's
  - c) Cosine form  $c_n$ 's
  - d) Determine the fundamental frequency of periodic signals
  - e) Determine DC (average value,  $x_0$ ,  $a_0$ ,  $c_0$ ) of periodic signal
  - f) Apply signal symmetry properties to simplify finding  $a_n$ 's,  $b_n$ 's,  $c_n$ 's,  $x_n$ 's
  - g) Time  $\rightarrow$  Frequency & Frequency  $\rightarrow$  Time;  $x(t) \rightarrow$  Magnitude and two-sided spectral plots and Magnitude and two-sided spectral plots  $\rightarrow x(t)$