EE 103 LECT #2

- HW for this week -
  1. Probs. 2.1 (i) & (ii) of the textbook
  2. Probs. 2.2 (i) & (ii)
  3. Probs. 2.9
  4. Probs. 2.15 (a) & (b)
  5. Probs. 2.22 (c)

- Quiz on Monday, April 10 is one of these except some changes of parameters. (15 min)

- Midterm is on May 3 (instead of May 1).

A copy of the textbook will be available in the SAE Library later this week.

- A typical ac voltage signal is

\[ V(t) = V \sin (\omega t + \phi), \ \omega = \frac{2\pi}{T}, \ \phi = \text{constant} \]

- Power dissipated in \( R \) (issu a filament)

\[ P = \frac{V^2}{R} = \frac{1}{2} [V \sin (\omega t + \phi)]^2 \]

- Average Power

\[ P = \frac{1}{T} \int_0^T p(t) \, dt \]

\[ = \frac{V^2}{R T} \int_0^T \sin^2 (\omega t + \phi) \, dt \]

\[ \approx \frac{V^2}{2} \]
For 120 V A.C. signal, for 1000 W light bulb:

\[ P = \frac{1}{2} \cdot (120)^2 = 100 \text{W} \]

Thus:

\[ R = \frac{1}{2} \cdot \frac{120}{100} = 0.6 \Omega \]

A 1000 W light bulb has 0.6 \( \Omega \) filament.

\( [V] \) is a voltage unit, \( [\text{V}] \) magnitude.

---

**Table 2.1 Transformations of Signals**

<table>
<thead>
<tr>
<th>Name</th>
<th>( x(t) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time reversal</td>
<td>( x(-t) )</td>
</tr>
<tr>
<td>Time-scaling</td>
<td>( x(at) )</td>
</tr>
<tr>
<td>Time-shifting</td>
<td>( x(t - t_0) )</td>
</tr>
<tr>
<td>Amplitude reversal</td>
<td>( x(t) ) \text{ to } \text{mirror image}</td>
</tr>
<tr>
<td>Amplitude scaling</td>
<td>( x(t) ) to ( k x(t) )</td>
</tr>
<tr>
<td>Amplitude shifting</td>
<td>( x(t) ) \text{ to } x(t) + c</td>
</tr>
</tbody>
</table>