ME 360
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Pre-requisites:
► ECE 320 or ECE 225 (Circuits)
► AEM 250 (Strength of Materials)

Office Hours: 9:00AM - 11:00AM MWF

ME 360 Pre-requisite Knowledge from

- Circuits
- Mechanics of Materials

See section 1 of the ME 360 Course Manual

Section #1 of ME 360 Course Manual
Pre-requisite Knowledge

Conversion Factors
\[ g_c = 1 = \frac{\text{kg} \cdot \text{m}}{\text{N} \cdot \text{s}^2} = \frac{\text{slug} \cdot \text{ft}}{\text{lbf} \cdot \text{s}^2} = 32.178 \frac{\text{ft} \cdot \text{lbm}}{\text{lbf} \cdot \text{s}^2} \]

Length 1 in = 2.54 cm = 0.0254 m = 25.4 mm
Mass 1 lbm = 0.4536 kg = 453.6 g = 16 oz. Av.
Force 1 lbf = 4.448 N
Power 1 W = 1 kg·m²/s³ = 1 N·m/s = 1 volt-amp
1 hp = 550 ft·lbf/s = 746 W

Conversion Factors
► Where do conversion factors come from?
► Define 1 in = 2.54 cm
► Divide both sides by the term (1 in),

Conversion Factors
► We can certainly multiply 10.0 inches by 1,
\[ 10.0 \text{ in} = (10.0 \text{ in}) \times (1) \]
► Insert our conversion factor,
\[ 10.0 \text{ in} = (10.0 \text{ in}) \cdot \]

Units in Engineering
► If you work a problem and your dimensions are inconsistent, or
► If you work a problem and your units are incorrect, or
► If you work a problem and you leave off the units,

Your answer is _______________
Question #1
The speed of a rotating shaft is given as $\omega = 2500$ RPM
What is the speed in radians/sec?

Question #2
The speed of a rotating shaft is given as $\omega = 262$ rad/sec
What is the speed in Hz?

A few words about units!
- Units of force:
  - newtons ( ),
  - pounds ( or )
- Units of mass:
  - kilograms ( ),
  - pounds-mass ( or ),
  - slugs

A few more words about units!
- Key definitions:
  1 $N = (1 \text{kg}) \left(1 \text{m} \text{/sec}^2\right)$
  1 $\text{lb} = (1 \text{slug}) \left(1 \text{ft} \text{/sec}^2\right)$
  1 $\text{lb} = (1 \text{lbm}) \left(32.2 \text{ft} \text{/sec}^2\right)$

Even more about units!
- Given the weight of an object, determine mass by $W = mg \rightarrow m = \frac{W}{g}$
- $W_1 = 1000 N$
  $m = \frac{W}{g} = \frac{1000 N}{9.8 \text{ m/s}^2}$
- $W_2 = 225 \text{ lb}$
  $m = \frac{W}{g} = \frac{225 \text{ lb}}{32.2 \text{ ft/s}^2}$
Significant Digits

In ME 360, we will follow the rules for significant digits.
Be especially careful with computer generated output.
Tables created with Microsoft Excel are particularly prone to having excessive significant digits!

Rules for Significant Digits

In multiplication, division, and other operations, carry the result to the same number of significant digits that are in the quantity used in the equation with the least number of significant digits.

\[234^2 = 54756 \rightarrow 54800\]

Note that if we expand the limits of uncertainty,

\[233.5^2 = 54522.25\]
\[234.5^2 = 54990.25\]

In addition and subtraction, do not carry the result past the first column containing a doubtful digit (going left to right).

\[
\begin{array}{c}
1234.5 + 35.678 \\
1270.178
\end{array}
\]
\[
\begin{array}{c}
23400 + 35.678 \\
383710.2
\end{array}
\]

In a lengthy computation, carry extra significant digits throughout the calculation, then apply the significant digit rules at the end.

As a general rule, when no other information is available, many engineering values can be assumed to have:

- **_** significant digits if first digit is 2 through 9,
- **_** significant digits if first digit is 1

ME 360 Website

www.me.ua.edu/me360

I use an email list frequently.
Messages from me will normally start with ME360:
My email address: jparker@eng.ua.edu