EF 151 Exam #4, Fall, 2005

Name: ___________________________  Section: _____________

This exam consists of 10 short-answer questions, each worth 10 points.

Be sure to:
• Show all of your work
• Include units for all answers
• Include the correct number of significant digits
• Include directions for all vectors
• Write your final answer in the box provided
• Provide a FBD and KD where required

Hints:
• Stay calm
• Glance over all problems, tackle the “easy” ones first
• Use reasonableness to guide you
• Allow yourself an average of 5 minutes per problem

Useful Conversions
• 1 gallon = 231 cubic inches
• 1 gallon = 4 quarts
• 1 gallon = 128 fluid ounces
• 1 m³ = 1000 L
• 1 acre = 43,560 ft²
• 1 mile = 8 furlongs
• 1 fathom = 6 ft
• 1 rod = 16.5 ft
• 1 chain = 22 yards
• 1 inch = 25.4 mm
• 1 watt = 1 N m/sec
• 1 hp = 745.7 watts (approx.)
• 1 hp = 550 ft lb / sec
• 1 lb = 4.45 N (approx.)
• 1 m = 1000 mm
• 1 g = 32.2 ft/sec² = 9.81 m/sec²

Geometry/Trig
• Area of a circle = πr²
• Volume of a cylinder = πr²h
• Law of Sines
  \[
  \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}
  \]
• Law of Cosines
  \[
  c^2 = a^2 + b^2 - 2ab \cos C
  \]

Constant Acceleration
\[
\begin{align*}
v_2 &= v_1 + a \Delta t \\
s_2 &= s_1 + \left( \frac{v_1 + v_2}{2} \right) \Delta t \\
s_2 &= s_1 + v_1 \Delta t + \frac{1}{2} a \Delta t^2 \\
s_2 &= s_1 + \frac{v_2^2 - v_1^2}{2a}
\end{align*}
\]

Uniform Circular Motion
\[
\begin{align*}
a_n &= \frac{v^2}{\rho} \quad \text{(any curve)} \\
a_n &= \rho \omega^2 \\
v &= \omega \rho \\
T &= \frac{2\pi}{\omega} \\
f &= \frac{1}{T} \\
\Delta s &= \rho \Delta \phi \\
\omega &= 2\pi f
\end{align*}
\]

Projectile Motion
\[
y = x \tan \theta + \frac{x^2}{2v_0^2} \left( -g(1 + \tan^2 \theta) \right)
\]
Assumes origin at launch point
θ – launch angle
v₀ – launch velocity

Relative Motion
\[
\vec{v}_B = \vec{v}_A + \vec{v}_{B/A}
\]

Force and Acceleration
\[
F_{net} = m\vec{a}
\]