Name: _____

Seat Assignment: _____

Specify your EXAM ID on the right. Use 000 if you don't know your exam ID.

0 ○	0 ○	0 ○
1 ○	1 ○	1 ○
2 ○	2 ○	2 ○
3 ○	3 ○	3 ○
4 ○	4 ○	4 ○
5 ○	5 ○	5 ○
6 ○	6 ○	6 ○
7 ○	7 ○	7 ○
8 ○	8 ○	8 ○
9 ○	9 ○	9 ○

Circle your **TEAM SECTION**

8:10	**A212 Matt**	**A216 Braxton**	**A217 Eric**	**A218 Cole**
9:40	**B212 Matt**	**B216 Braxton**	**B217 Landon**	**B218 Cole**
11:10	**C212 Landon**	**C216 Braxton**	**C217 Eric**	**C218 Cole**
12:40	**D212 Min**	**D216 Erik**	**D217 Ben**	**D218 Eric**
2:10	**E212 Min**	**E216 Erik**	**E217 Ben**	**E218 Landon**
3:40	**F212 Min**	**F216 Erik**	**F217 Ben**	

Instructions

- Do not open the exam until instructed to do so.
- Do not leave if there is less than 5 minutes to go in the exam.
- When time is called, immediately stop writing, remain seated, and pass your exam to the center aisle.
- Working after time is called results in an automatic deduction.
- Turn your equation sheets in with your exam.

Guidelines

- Assume 3 significant figures for all given numbers unless otherwise stated
- Show all of your work – no work, no credit
- Write your final answer in the box provided
- Include units for all answers

1. (2 pt) A ladder is leaning against a wall. If you were going to climb the ladder where do you have to have a friction force?

At the floor	At the wall	Both
○	○	○

2. (2 pt) A vertical pitot tube is placed in a stream of water. The immersed end is 0.3 m below the surface. The water in the pitot tube rises 0.1 m above the surface. What is the speed of the stream?

$\sqrt{2g(0.1)}$	$\sqrt{2g(0.3)}$	$\sqrt{2g(0.4)}$
○	○	○

3. (2 pt) A horizontal pipe with a fluid flowing in it changes from a 1" diameter to a 2" diameter. How does the pressure (P2) in the 2" section compare to that in the 1" section (P1)?

P1 < P2	P1 = P2	P1 > P2
○	○	○

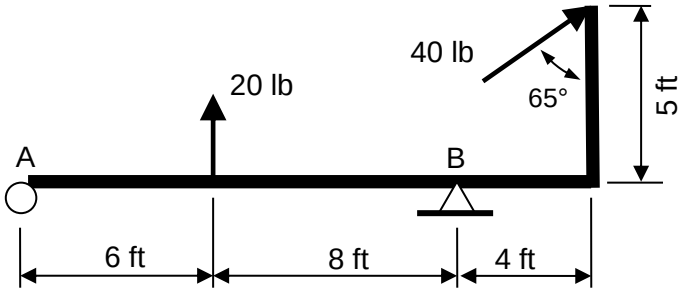
4. (2 pt) A composite 20’ beam is made from two 20’ beams of different materials glued together. If the composite beam is under an axial load, what is the same for both of the materials?

Stress	Strain	Force
○	○	○

5. (2 pt) Assuming an average air density of 0.78 kg/m^3, what is the standard atmospheric pressure on the top of Miller Peak, 2885 m above sea level? (Standard Pressure at Sea Level = 101.3 kPa).

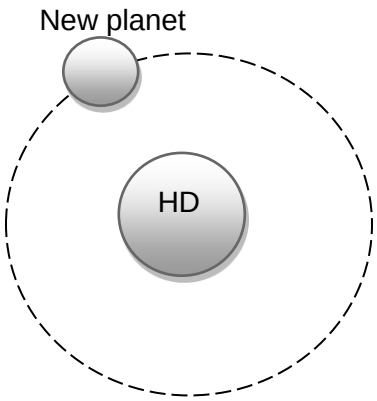
79.2 kPa	101.3 kPa	123.4 kPa
○	○	○

6. (15 pts) Determine the reaction (magnitude and direction) at point B. Neglect the weight of the beam. **A separate, complete FBD is required for full credit.**

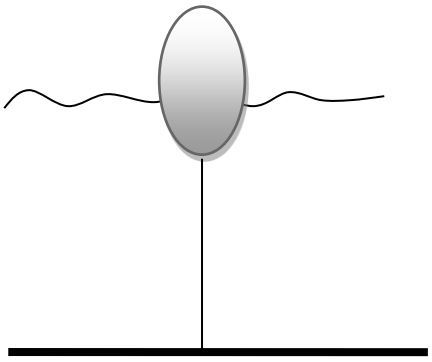


7. (15 pts) Determine the minimum diameter of a 11 m long nylon rope if you want to limit the stretch to 1.5 cm and have a factor of safety of 2.5 when the rope supports a 1400 N force. (E = 3.0 GPa)

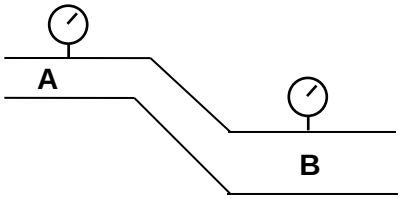
8. (15 pts) In 2004 astronomers discovered a new planet orbiting very close to a star called HD. The average radius of its orbit is 6.43×10^6 km and it takes 3.09 days to complete one orbit. What is the mass of star HD? ($G = 6.6738 \times 10^{-11}$ N-m^2/kg^2)



9. (15 pts) A hollow plastic buoy with a volume of 0.42 m^3 is held with 1/3 of its volume submerged in a fresh water lake by a cord anchored to the bottom of the lake. The tension in the cord is 900N. What is the mass of the buoy?
A separate, complete FBD is required for full credit.



10. (15 pts) At point A in a pipeline the speed of the water is 1.5 m/s and the gauge pressure is 4.80 kPa. Find the gauge pressure at point B if it is 1.8 m lower and has twice the cross-sectional area.



11. (15 pts) 1.8 cm^3 of water (η=8.9x10^{-4} Pa-s) is being pushed out of a syringe through a 3.5 cm long needle in 0.4 s. The interior diameter of the needle is 1.37 mm. What is the pressure difference between the two ends of the needle?