YOUR NAME _____

SECTION (TA)_____

ENGRD 202: MECHANICS OF SOLIDS
MAKE-UP PRELIM II: December 9, 2002 9:00-10:30 AM

Please carry out all work on these sheets; additional sheets are available, as needed.

Possibly Helpful Hints:

a) **Vector** quantities should be distinguished from scalars. Points will be lost if **vectors** are not properly identified.
b) Free-body diagrams should be drawn for almost all mechanics problems.
c) All answers must have correct units.
d) Questions posed to practicing engineers often contain extraneous information; perhaps here too.
e) If you write two answers to a question, only the first will be graded.
f) Box or circle all answers.

Academic Integrity is expected of all students of Cornell University at all times, whether in the presence or absence of members of the faculty and staff.

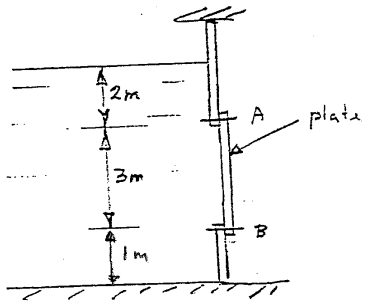
Understanding this, I declare that I shall not give, use or receive unauthorized aid in this examination.

Signature of Student:_____

Problem 1. _____/30
Problem 2. _____/35
Problem 3. _____/35

TOTAL _____/100

2. (30%) Figure 2 shows a rectangular plate of width, 2m normal to the paper, in the vertical side of a tank containing a liquid of specific weight $\gamma = 10\text{kN/m}^3$ Find (a) the total horizontal force acting on the plate, (b) the tensile forces in the bolts at A and at B.



2.) (35%) Fig. 1 shows a rigid horizontal bar BCD hinged to a wall at its left-hand end B and supported by two vertical cables at C and D. Find (a) the values of the forces in each cable due to a load of 20,000 lb. applied to the right-hand end D of the bar. Find (b) the vertical displacement at the end D.

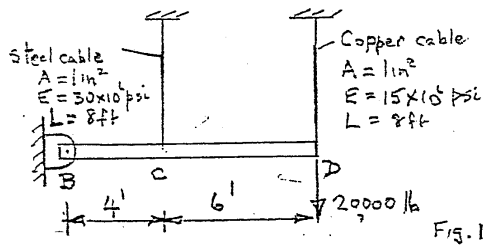
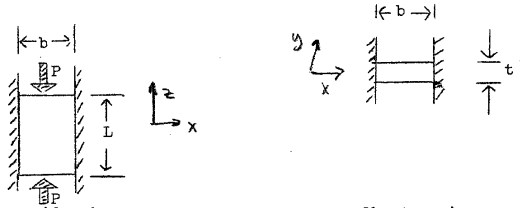


Fig. 1

Problem 3.

(35) Shown in Figure 1 is a bar of original length L , width b and thickness t . It is just held between two rigid walls whose surfaces can be assumed to be smooth and then it is compressed by forces P as shown.



1a. side view 1b. top view

(10) a.) Considering the bar to be isotropic and linear elastic, find the change in both the length and the thickness that has been caused by the load P . The bar has a Young's modulus E , a Poisson's ratio ν and a shear modulus G .

(15) b.) By considering axial stress and strain, compute the "effective Young's modulus" E' for this compressive loading.