February 13, 2002 Name

## **CVEN 3161**

## Mechanics of Materials I

Midterm Examination # 1: Closed Books and Closed Notes, Duration: One Hour

• Problem # 1: 40 Points

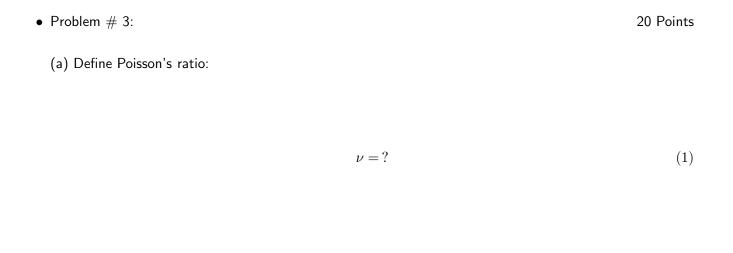
A conical bar is suspended at the top at section A. Given the specific weight  $\gamma$  of the material, what is the behavior of the bar under its own weight? Determine the

- (a) internal force diagram N(x) = ?
- (b) normal stress diagram  $\sigma(x) = ?$
- (c) normal strain diagram  $\epsilon(x) = ?$
- (d) axial displacement diagram u(x) = ?

• Problem # 2: 40 Points

A cubical soil specimen ( $h \times a \times b = 4 \times 4 \times 4 \, in^3$ ) is loaded in the y-direction by the pressure  $p=1000 \, psi$  in the rigid cavity as shown below. Assuming linear elastic behavior with  $E=1000 \, ksi$  and  $\nu=0.2$ , and neglecting interface friction,

- (a) what are the lateral confining stresses  $\sigma_x = ?, \sigma_z = ?$  in the specimen at the faces of the rigid walls,
- (b) what is the axial compaction of the specimen, i.e. what is the change of height  $\Delta h = ?$  of the specimen,
- (c) how would the confining stress and the compaction change in case of incompressible behavior?



(b) What are upper and lower bound values of Poisson's ratio?

$$? \le \nu \le ? \tag{2}$$

(2)