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 γ 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?

- Problem # 3:   20 Points

(a) Define Poisson's ratio:

$$\nu = ? \tag{1}$$

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

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