**Strength of Materials Math Worksheet**

1. **Calculate the maximum tensile and compressive forces allowed for the cross-sectional area shown in Figure 1. The maximum tensile strength is 500 lb/**$in^{2}$ **(pounds per inches squared). The maximum compressive strength is 5,000 lb/**$in^{2}$**. Use the following equations to complete the problem. Show your work and calculations.**

cross-sectional area = (B) x (L)

maximum tensile force = (maximum tensile strength) x (cross-sectional area)

maximum compressive force = (maximum compressive strength) x (cross-sectional area)



**Figure 1: Cross-sectional area.**

1. **Calculate the maximum tensile and compressive forces allowed for the following two cross-sectional areas shown in Figure 2. The maximum tensile strength is 3,750 lb/**$in^{2}$**. The maximum compressive strength is 4,850 lb/**$in^{2}$**. Use the following equations along with those in #2 to complete the problem. Show your work and calculations.**

cross-sectional area = $π x (radius)^{2}$ $π = 3.14$



**Figure 2: Cross-sectional areas.**

1. **Part 1: Calculate the compressive force for the cross-sectional area shown in Figure 3. The original length of the member was 100-in long. After applying the compressive force, the member was 99-in long. The modulus of elasticity for the material used in the cross section is 10,000 lb/**$in^{2}$**. Use the following equations along with those in #2 and #3 to complete the problem. Show your work and calculations.**

**Part 2: Calculate the tension force for the cross-sectional area shown in Figure 3. The original length of the member was 100-in long. After applying the tensile force, the member was 103-in long. The modulus of elasticity for the material used in the cross section is the same as in #2 above. Use the following equations along with those in #2 and #3 to complete the problem. Show your work and calculations.**

$σ$ = E \* $ε$ $σ$ = stress

$ε$ = change in length / original length $ε$ = strain

E = modulus of elasticity

change in length = (length after force applied) – (original length)

If the change in length is negative, take the absolute value to get a positive number

force = $σ$ \* cross-sectional area



**Figure 3: Cross-sectional area.**