Assignment 3

Unit 4 - Week 3

1. (10 points) The mechanical properties of a material are determined under conditions that simulate those of its intended use. In the following figure, the direction of loading is indicated.

   a. If a tensile stress is applied in the direction of the principal axes, the material will exhibit stress-dependent behavior. Describe the behavior and the resulting deformation.

   b. If a compressive stress is applied in the direction of the principal axes, the material will exhibit stress-dependent behavior. Describe the behavior and the resulting deformation.

2. (10 points) The following figure shows a stress-strain curve for a particular material. The curve is linear up to the yield point. After the yield point, the curve is nonlinear, indicating plastic deformation.

   a. Describe the mechanical behavior of the material before and after the yield point.

   b. If a tensile load is applied to this material, what would be the expected deformation and stress-strain relationship?

3. (10 points) The following figure shows a cross-section of a material with a composite structure. The material consists of two layers, each with different mechanical properties.

   a. Describe the expected stress and strain distribution in each layer.

   b. If a load is applied to this material, how would the stress and strain be transmitted between the layers?

4. (10 points) The following figure shows a diagram of a material under different loading conditions. The loading conditions include tension, compression, shear, and bending.

   a. For each loading condition, describe the expected stress and strain distribution in the material.

   b. If a combination of loading conditions is applied, how would the material respond?

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Note: The diagrams in the assignment are not displayed in the text.