Problem M21

a) A tensile specimen is made of an epoxy (a thermosetting polymer). It is loaded in the z direction to a stress of 100 MPa. Assuming that the epoxy remains elastic, what are the resulting strains in the x, y and z directions? The Young's modulus of the epoxy is 3 GPa and the Poisson's ratio is 0.3

b) A thin (t<<R) layer of an epoxy adhesive is used to join two silicon carbide bars of circular cross-section, as shown below. An axial (z direction) tensile stress of 100 MPa is applied to the joint as shown. Calculate the axial strain (ε_{zz}) in the adhesive. The Young's modulus of the epoxy adhesive is 2 GPa, the Poisson's ratio is 0.3. The Young's modulus of the SiC is 450 GPa and the Poisson's ratio is 0.16. State any assumptions/approximations that you make in solving this problem - note that you may not be able to achieve an exact solution but you should aim to obtain a good approximation. Hint: think about the transverse strains in the adhesive (ε_{xx} and ε_{yy}).