1. A rectangular steel (E = 30,000 ksi, ν=0.25) bar of 0.5 inch thickness has a gap of 0.01 inch between the section at D and a rigid wall before the forces are applied. Assuming that the applied forces are sufficient to close the gap determine: (a) the movement of section at C with respect to the left wall. (b) the strain recorded by the strain gage at point E. The strain gage is mounted at 20° to the axis as shown.

2. A solid circular steel (G_s = 12,000 ksi) shaft is loaded as shown. Determine: (a) the angle of rotation of section at D with respect to section at A. (b) the maximum shear stress

3. (a) A circular shaft has a uniform distributed torque of q in-lb/in and two concentrated torques as shown. Determine the internal torque acting on the section at D

(b) The rotation of three sections of a circular shaft due to the applied torques are as given below. Determine the maximum shear strain in section BC

(c) The fiber stress at point A in a section of a beam was found to be \( \sigma_A = 80 \text{ MPa} \). Determine the fiber stress at point B which is at the junction of the web and flange as shown.

(d) Determine the fiber stress at point A which is at the bottom of the beam.

Answers:
1. \( u_c = 0.025 \text{ in} \)
2. \( \theta_D - \theta_A = 0.303 \text{ rads clock-wise} \)
3. \( \varepsilon_E = -358 \mu \)
   \( \tau_{\text{max}} = 127.3 \text{ ksi} \)
   \( a) T_D = 1.758 qL \)
   \( b) \gamma_{\text{max}} = 2250 \mu \)
   \( c) \sigma_B = 120 \text{ MPa} \)
   \( d) \sigma_A = 12 \text{ MPa} \)