GLASGOW CALEDONIAN UNIVERSITY

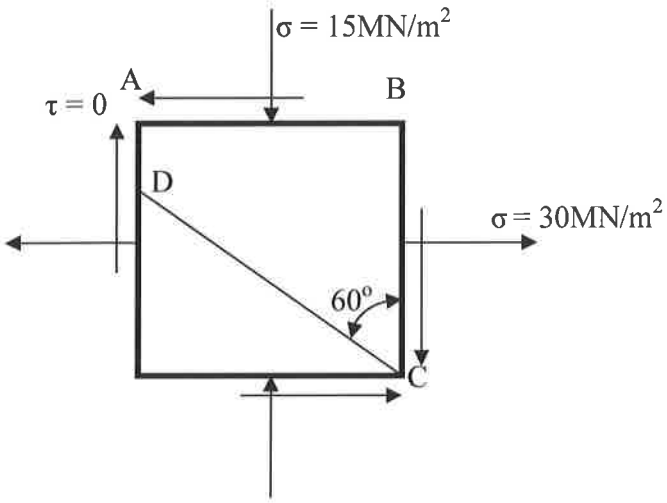
School of Engineering & Built Environment

ENGINEERING DESIGN & ANALYSIS 2 (M2H721926)

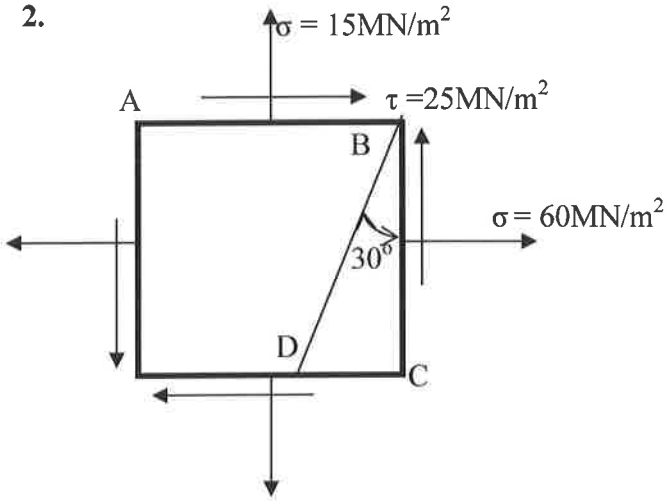
Tutorial: 2D Stress Analysis

For each of the elements of component material shown below, determine the principal stresses (σ_1, σ_2), the maximum shear stress (τ_{max}), the angle of the principal planes, and the stresses acting on the planes indicated (σ_θ, τ_θ) using both *analytical* and *graphical* methods.

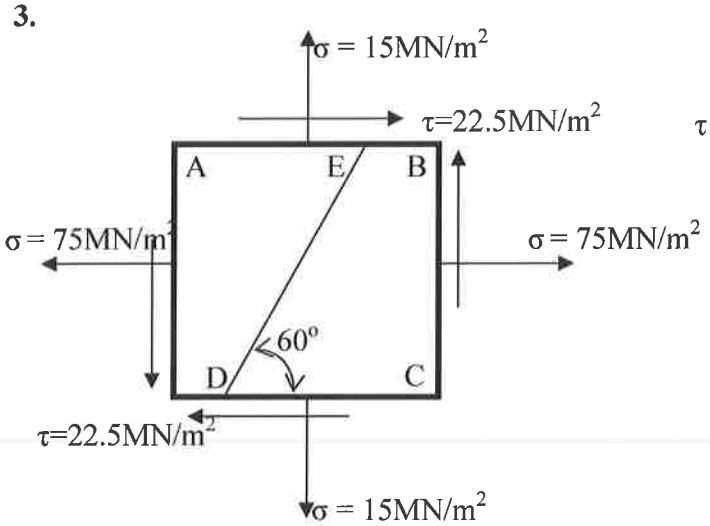
1.



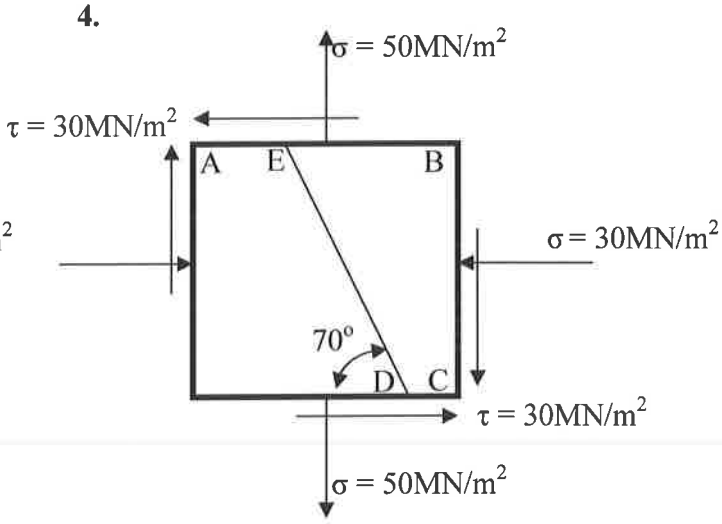
2.



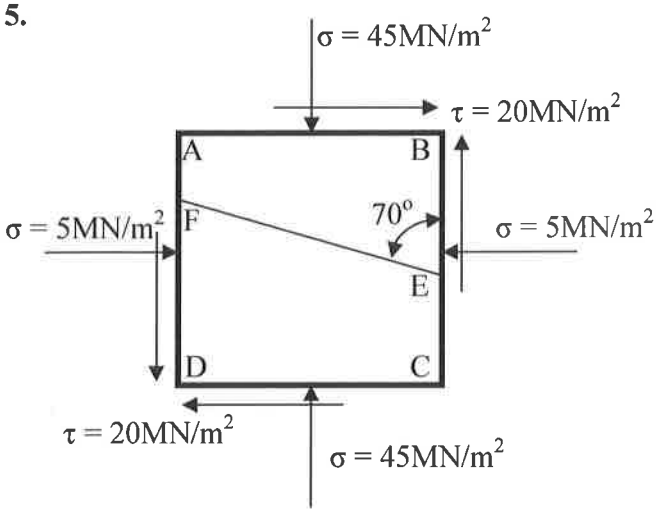
3.



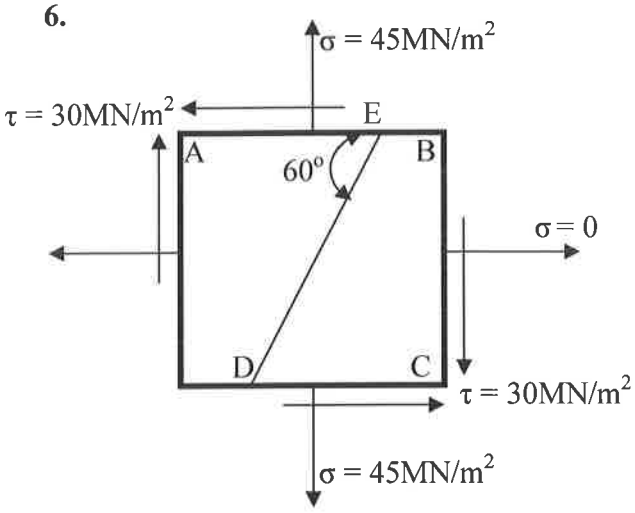
4.



5.



6.



Tutorial : 2D Stress Analysis - Answers

1. $\sigma_1 = 30$ MN/m^2; $\sigma_2 = -15$ MN/m^2; $\tau_{max} = 22.5$ MN/m^2; $\sigma_{\theta BD} = -3.75$ MN/m^2; $\tau_{\theta BD} = 19.5$ MN/m^2
2. $\sigma_1 = 71.1$ MN/m^2; $\sigma_2 = 3.9$ MN/m^2; $\tau_{max} = 33.6$ MN/m^2; $\sigma_{\theta BD} = 27.1$ MN/m^2; $\tau_{\theta BD} = -32$ MN/m^2
3. $\sigma_1 = 82.5$ MN/m^2; $\sigma_2 = 7.5$ MN/m^2; $\tau_{max} = 37.5$ MN/m^2; $\sigma_{\theta AD} = 40.5$ MN/m^2; $\tau_{\theta AD} = -37.2$ MN/m^2
4. $\sigma_1 = 60$ MN/m^2; $\sigma_2 = -40$ MN/m^2; $\tau_{max} = 50$ MN/m^2; $\sigma_{\theta CD} = -39.9$ MN/m^2; $\tau_{\theta CD} = -2.7$ MN/m^2
5. $\sigma_1 = 3.3$ MN/m^2; $\sigma_2 = -53.3$ MN/m^2; $\tau_{max} = 28.3$ MN/m^2; $\sigma_{\theta BD} = -27.5$ MN/m^2; $\tau_{\theta BD} = 28.2$ MN/m^2
6. $\sigma_1 = 60$ MN/m^2; $\sigma_2 = -15$ MN/m^2; $\tau_{max} = 37.5$ MN/m^2; $\sigma_{\theta CD} = -37.2$ MN/m^2; $\tau_{\theta CD} = 34.5$ MN/m^2