Assignment 1 (Due date: 26 February)

Problem 1

The stress - strain - displacement relationships for 3-D elasticity are given by:

Strain – displacemnt relation : $\epsilon_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i})$

Stress – strain relation : $\sigma_{ij} = \frac{E}{(1+\nu)}\epsilon_{ij} + \frac{\nu E}{(1+\nu)(1-2\nu)}\delta_{ij}\epsilon_{ij})$

Use indicial notation to express the following equilibrium equations in terms of the displacemnt components.

Equilibrium equation : $\sigma_{ji,j} = 0$

Problem 2

Let $f(\underline{x})$ & $g(\underline{x})$ be two continuous functions over a surface Ω, bounded by a boundary Γ. If $\nabla^2 g = 0$,
show that by the divergence theorem you can replace the
domain integral $\int_\Omega (\nabla^2 f)\, g\, d\Omega$ by two boundary integrals.

Problem 3

Use Gauss quadrature method to integrate the function Log $(x^2 + y^2)$ along a straight line connecting the points (1, 2) and (5, 3). Comment on the accuracy of the result.

Assignment 2 (Due date: 4 March)

Problem 1

Use Matlab PDE Toolbox to predict the stress intensity factor for a plate (10 units by 10 units), containg a central elleptical hole (2 units along x-axis by 1 unit along y-axis) and subjected to a uniform stress = 1, along y-axis.

Assignment 3 (Due date: 23 March)

Problem 1

Use LACONBE to solve the torsion problem for an equalateral triangle (each side = 3 units). Assume $G\theta = 1$. Use the output to determine the location and value of the maximum shearing stress.

Problem 2

Modify LACONBE so that it can handel the convention boundary condition a u + b q, where a and b are constatnts. Use the developed code to solve Laplace equation for a unit square {{0,0},{1,0},{1,1},{0,1}} with the following b.c : u(0,y) = q(x,0) = q(x,1) = 0 and u +2q = 1 along the side (1,y). Compute the solution at 3 selected points inside the domain and compare with the exact solution: $u = x/3$.