1. Using the general Hooke’s law, demonstrate the relation between Young’s and bulk modulus.

σ = (E/(1+ν)(1-2ν))(εx + εy + εz)I

Comparando essa equação com a equação de estresse em termos do módulo volumétrico (K), temos:

K = (E/(3(1-2ν)))

Portanto, podemos concluir que a relação entre o módulo de elasticidade (E) e o módulo volumétrico (K) para um material elástico linear e isotrópico é:

E = 3K(1-2ν)/(1+ν)

2. Demonstrate the relation below between elastic constants G = E/2(1+ν)

E = 3K(1-2ν)/(1+ν)

G = (3K(1-2ν)/(1+ν))/ 2(1+ν)

G = 3K(1-2ν)/2(1+ν)²

3. A cylindrical sample of concrete, with 20 cm height and 10 cm diameter, was tested in a uniaxial compression test where axial and radial deformations were registered. At a point during the elastic regime, the following values were logged: axial stress: 20 Mpa, axial deformation: 0.2 mm and radial deformation: 0.015 mm. Find the corresponding material D matrix tobe used in a plane stress linear-elastic analysis.

syms E nu

d = E/((1+nu)\*(1-2\*nu))\*[1-nu nu nu 0;

nu 1-nu nu 0;

nu nu 1-nu 0;

0 0 0 (1-2\*nu)/2];

sig = [0.0; 20; 0.0; 0.0];

eps = [0.015/100; 0.2/200; 0.0; (0.015/100+0.2/200)];

A1 = d\sig == eps;

C = solve (A1(2));

A2 = subs(A1(1), E, C);

B = solve (A2);

D = C/(1-B^2)\*[1 B 0;

B 1 0;

0 0 (1-B)/2];

