459.731 Theory of Poroelasticity

Spring, 2010, Ki-Bok Min

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Assignment #4 (29 March)

due by 5 April 2010

1 . A displacement field is given by $u_1 = 3x_1x_2^2$, $u_2 = 2x_3x_1$, $u_3 = x_3^2 - x_1x_2$. Determine the strain tensor ϵ_{ij} and check whether or not the compatibility conditions are satisfied.

2. Given the following stress distribution,

$$\tau_{xx} = 3x^2 + 4xy - 8y^2$$

$$\tau_{yy} = 2x^2 + xy + 3y^2$$

$$\tau_{xy} = -\frac{1}{2}x^2 - 6xy - 2y^2$$

$$\tau_{zz} = \tau_{zx} = \tau_{yz} = 0$$

determine, in the absence of body forces, whether equilibrium exists.

3. Discuss (and summarize) the physical interpretation of the divergence of a vector (less than a page). You may take examples from stress equilibrium, flow of an incompressible fluid, heat conduction or fluid flow in porous media.