TOBB EKONOMİ VE TEKNOLOJİ ÜNİVERSİTESİ

MAK506 THEORY OF ELASTICITY
FALL 2010
Due date: 22.11.2010
HOMEWORK 4

1. (Pr. 4.2., Elasticity, M. H. Sadd) Substituting the general isotropic fourth-order form (4.2.6) into (4.2.3), explicitly develop the stress-strain relation (4.2.7).

$$\sigma_{ij} = C_{ijkl} e_{kl} \qquad (4.2.3)$$
$$C_{ijkl} = \alpha \delta_{ij}\delta_{kl} + \beta \delta_{ik}\delta_{jl} + \gamma \delta_{il}\delta_{jk} \qquad (4.2.6)$$
$$\sigma_{ij} = \lambda e_{kk}\delta_{ij} + 2\mu e_{ij} \qquad (4.2.7)$$

2. (Pr. 4.3., Elasticity, M. H. Sadd) Following the steps outlined in the text, invert the form of Hooke's law given by (4.2.7) and develop form (4.2.10). Explicitly show that $E = \mu(3\lambda + 2\mu)/(\lambda + \mu)$ and $\nu = \lambda/\left[2(\lambda + \mu)\right]$

$$e_{ij} = \frac{1+\nu}{E}\sigma_{ij} - \frac{\nu}{E}\sigma_{kk}\delta_{ij} \qquad (4.2.10)$$

3. (Pr. 4.4., Elasticity, M. H. Sadd)Using the results of Exercise 4-3,show that $\mu = E/\left[2(1+\nu)\right]$ and $\lambda = E\nu/\left[(1+\nu)(1-2\nu)\right]$