School of Civil & Environmental Engineering
Seoul National University
Kwanak-Gu, Seoul 151-742, Korea

Mid-term Exam II, Theory of Elasticity

2016. 5. 12.

(Closed everything, and answers may be given in Korean or English.)

Prob. 1 Derive the compatibility equation for two-dimensional plane problems without body force in terms of the stress function in the Cartesian coordinate system. (20 pts.)

Prob. 2 Derive the equilibrium equations for two-dimensional problems in the polar coordinate system from physical viewpoint. (20 pts.)

Prob. 3 Derive the compatibility equation for two-dimensional plane problems without body force in the polar coordinate system, and obtain the stress function and stress components for axi-symmetric problems. Discuss the characteristics of the integration constants of the stress function in accordance with those of the given domain. Utilize the following relation. (30 pts.)

$$\frac{\partial^2()}{\partial x^2}+\frac{\partial^2()}{\partial y^2}=\frac{\partial^2()}{\partial r^2}+\frac{1}{r}\frac{\partial()}{\partial r}+\frac{1}{r^2}\frac{\partial^2()}{\partial \theta^2}$$

Prob. 4 Derive the displacements corresponding to the stress field obtained in Prob. 4 for ν = 0. Discuss the physical meaning of the integration constants in the displacement field. (10 pts.)

Prob. 5 Derive the Flamant solution, and present the stress components in the Cartesian coordinate system. (20 pts.)

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