

Name.....Student I.D.....

Department of Mining and Materials Engineering
Faculty of Engineering
Prince of Songkla University

Mid-term Exam for Semester: 1

Academic Year: 2012

Date: August 7, 2012

Time: 9.00-12.00

Subject: 238-500 Advanced Mechanical Behavior of Materials

Room: S203

Instructions

1. There are 4 problem sets. Please do all of them. Write your answers in the space provided. If you need more space, you can write on the back of paper.
2. Text books and studying materials are not allowed.
3. Dictionary, calculator, and stationery are allowed.
4. This mid-term exam is counted for 25% of the total grade.

Asst. Prof. Dr. Thawatchai Plookphol

Problem No.	Full Score (points)	Student's Score (points)
1.	20	
2.	40	
3.	30	
4.	10	
Total	100	

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Problem 1 (20 points)

Explain the following terms: (Please give example and/or draw graph, diagram to support your answer)

1.1 Homogenous solid (2 points)

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1.2 Isotropic solid (2 points)

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1.3 Anisotropic solid (2 points)

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1.4 Principal stress (2 points)

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1.5 Stress invariant (2 points)

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1.6 Linear elasticity (2 points)

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1.7 Non-linear elasticity (2 points)

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1.8 Snoek relaxation (2 points)

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1.9 Viscoelasticity (2 points)

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1.10 Viscoplasticity (2 points)

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Formula

For 2-D stress:

$$\det \begin{bmatrix} \sigma_{11} - \sigma & \sigma_{12} \\ \sigma_{21} & \sigma_{22} - \sigma \end{bmatrix} = 0$$

where, σ is the principal stress.

$$\bar{S} = \bar{\sigma} \cdot \hat{n}$$

$$S_i = \sum_{j=1}^3 \sigma_{ij} n_j$$

$$S^2 = S_1^2 + S_2^2 + S_3^2$$

$$\sigma = S_1 \cdot n_1 + S_2 \cdot n_2 + S_3 \cdot n_3$$

$$S^2 = \sigma^2 + \tau^2$$

where, S = Total stress acting on the plane,
 σ = Normal stress acting on the plane,
 τ = Shear stress acting on the plane, and
 $n_1, n_2,$ and n_3 are the direction cosines.