

**Prince of Songkla University**  
**Faculty of Engineering**

Midterm Examination : Semester II

Date : 24 December 2002

Subject : 235-402 Geotec Mining Engin.

Academic Year : 2002

Time : 09.00-12.00 a.m.

Room : R 201

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**Instruction**

1. There are 7 questions of this open examination, select to do only 5 questions
2. Dictionary, a calculator without programming capability are allowed
3. Answer all questions in this paper
4. Write your name in each page and returned all papers to controllers
5. Total marks are 100 or 30 %

Number	Mark	Received Mark
1	20	
2	20	
3	20	
4	20	
5	20	
6	20	
7	20	
<b>Total</b>	<b>100</b>	

Name ..... Surname ..... Code .....

**Bonne Chance et bon courage**  
**Danupon Tonnayopas**  
**18 Dec 2002**

1. Narathiwat gneiss sample was subjected to point load tests. The result was shown in a table following below.

- Calculate point load strength index ( $I_{s50}$ ),
- Find the anisotropy index, and
- Based on the answer a) estimate the unconfined compressive strength

Type	W mm	D mm	P kN						
i $\perp$	30.4	17.2	2.687						
i $\perp$	16.0	8.0	0.977						
i $\perp$	19.7	15.6	1.962						
i $\perp$	35.8	18.1	3.641						
i $\perp$	42.5	29.0	6.119						
i $\perp$	42.0	35.0	7.391						
b $\perp$	44.0	21.0	4.600						
b $\perp$	40.0	30.0	5.940						
b $\perp$	19.5	15.0	2.040						
b $\perp$	33.0	16.0	2.870						
d //	-	49.93	5.107						
d //	-	49.88	4.615						
d //	-	49.82	5.682						
d //	-	49.82	4.139						
d //	-	49.86	4.540						
d //	-	25.23	1.837						
d //	-	25.00	1.891						
d //	-	25.07	2.118						
d //	-	25.06	1.454						
d //	-	25.04	1.540						

Note : d = diametral; a = axial; b = block; i = irregular lump;  $\perp$  = perpendicular with failure plane; // = parallel with failure plane

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2. Given  $\sigma_1 = 700 \text{ N/m}^2$ ,  $\sigma_3 = -200 \text{ N/m}^2$ . Find  $\sigma$  and  $\tau$  on a plane making an angle of  $50^\circ$  with the major principal plane. Find the maximum shear stress by Mohr circle and calculate methods.

3. Compute the density, unit weight, void ratio, porosity, and degree of saturation of an undisturbed red Krabi claystone core. Measurement found a volume of  $0.0112 \text{ m}^3$  and a mass of 19.8 kg. After oven-drying at  $105^\circ \text{ C}$ , the mass was 17 kg. The average specific gravity of the dry core was 2.69.

4. A borehole is drilled and instrumented and then overcored, yielding the following values of the stress components in the plane perpendicular to the borehole:

$$\sigma_x = 60 \text{ MPa}$$

$$\sigma_y = 100 \text{ MPa}$$

$$\tau_{xy} = 20 \text{ MPa}$$

The x axis was horizontal and to the right. Find the magnitudes and directions of the maximum principal stresses in the plane perpendicular to the borehole.

5. Calculate the dynamic elastic moduli from test data of Sadao sandstone, NX core. Its has length 0.15 m., bulk density is  $2.453 \text{ g/cm}^3$ . P-wave travel time through core is 24.50 microsec and S-wave travel time through core is 46.00 microsec.

6. Two circular tunnels in competent have  $W_p/W_o = 2.0$  under stress field of  $\sigma_x = 40$  MPa and  $\sigma_y = 60$  MPa. Compute

- a) Stress concentration of boundary tangential stress
  - b) Distribution of tangential stress along the horizontal axis between two tunnels
  - c) Distribution of radial stress along the horizontal axis between two tunnels

7. Given the following data from an unconfined compression of saturated Kho Hong sandstone:  
 (suggest do in a graph)

Stress, kN/m <sup>2</sup>	Strain
100	0.0035
200	0.0080
300	0.0170
350	0.0270
400	0.0650

- a) Plot the stress-strain curve
  - b) Find the secant modulus of elasticity
  - c) Find the average modulus of elasticity for 50% of the failure stress.