มหาวิทยาลัยสงขลานครินทร์

คณะวิศวกรรมศาสตร์

การสอบปลายภาค ประจำภาคการศึกษาที่ 2	ปีการศึกษา 2551
สอบวันที่ 23 กุมภาพันธ์ 2552	เวลา 13.30-16.30 น.
วิชา 220-527 Geosynthetics Engineering	ห้องสอบ R201

ข้อกำหนด:

1. ข้อสอบ มี 6 ข้อ คะแนนเต็ม 50 คะแนน ให้ทำทุกข้อ
2. ให้นำสมุด Lecture, Sheet และ หนังสือ เข้าห้องสอบได้
3. ให้นำเครื่องคิดเลขทุกชนิดเข้าห้องสอบได้

ออกข้อสอบโดย

ดร. พิพัฒน์ ทองฉิม

17 กุมภาพันธ์ 2552

1. A geonet is being considered for primary leachate collection on the 200 ft. long side slope of a landfill. Using the data of Figure 4.8 in Koerner 's Book (1994), interpolating at a normal stress of 15,000 lb./ft.^{2} and a hydraulic gradient of 0.184, what is the global of safety for a flow rate of 2,500 gal./acre-day? The sum of partial factors of safety should be 8.0.
   (5 points)

2. What is the factor of safety of a slope behind a geomembrane-lined pond when it is empty if the soil is under undrained conditions? The slope is 2(H) to 1(V), 25 ft. deep, and will be of the toe failure type (i.e., n=1). The soil' s unconfined compression strength is qu = 750 lb./ft.^{2} and its unit weight is 115 lb./ft.^{3} **(5 points)**

3. Calculate the shear stresses and tensile forces on each of the interfaces of the components shown in the multilayer liner system on the slope of a landfill in the following sketch. The slope is 3H:1V with a 10-ft lift height of waste weighing 80 lb./ft.^{3} .The components and friction angles are follow :
   - Friction angle of waste = 38 deg.
   - Geotextile (needle-punch nonwoven): GT to GN, δ = 35 deg.
   - Geonet (3/8 in. thick-foamed): GN to GM, δ = 11 deg.

- Geomembrane (60-mil HDPE): GM to GN, δ = 15 deg

- Geonet (1/4 in. thick-solid): GN to GM, δ = 15 deg.

- Geomembrane (45-mil HDPE): GM to clay, δ=10 deg.

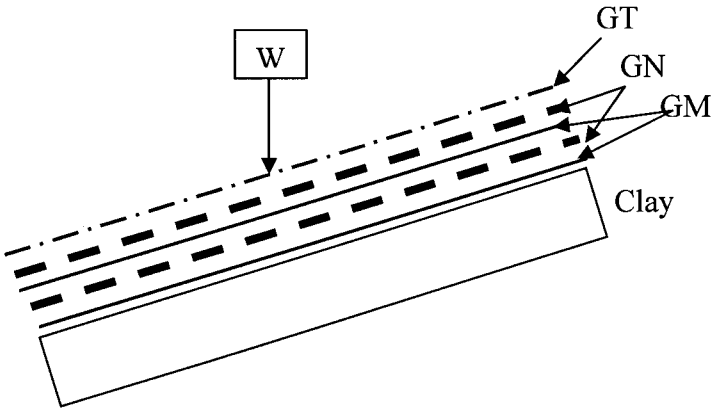
The allowable tensile strength of the different geosynthetics are as follows:

- Geonet-foamed: 300 lb./in.^{2}

- Geonet-solid : 400 lb./in.^{2}

- Geomembrane- HDPE: 2200 lb./in.^{2}

(10 points)



4. Calculate the tensile strain in a GCL as it deforms in an out-of-plane mode (as per the example problem of Section 6.3.3) for deformations of 0.10, 0.20, 0.30, 0.40 and 0.50 m. and plot the factor of safety. The allowable tensile strain of GCL is 14 %. The radius of the depression remains constant at 1.50 m. **(10 points)**

5. Consider a 6 m. pavement in an area with an extremely high rainfall intensity of 150 mm./hr. for a 10-year rainfall intensity. The runoff coefficient is 0.45. The infiltration coefficient from subgrade is 0.25. The release factor from an open graded stone base to be 1.0. Use a roughness coefficient of 0.010 for smooth interior pipe.

5.1 Determine the quantity of flow at a 90 m. distance. **(5 points)**

5.2 Determine the diameter of pipe (Slope is 100H:3V). **(5 points)**

6. Consider a 180x360 $m.^2$ landfill cell with a tentative primary leachate removal system. (i.e., perforated pipe system as shown in Figure 7.13) The cell is uniformly sloped to the sump at 2 % for both header and feeder pipes. The landfill is located in an area with a rainfall intensity of 75 mm./hr. for a 10-year rainfall intensity. Given h_c = 0.3 m. and k = 1.0 cm./sec.

6.1 Determine the pipe spacing. **(4 points)**

6.2 Determine the pipe size required before waste is placed in the cell. **(6 points)**