

มหาวิทยาลัยสงขลานครินทร์
คณะวิศวกรรมศาสตร์

การสอบปลายภาค ประจำภาคการศึกษาที่ 2
สอบวันที่ 22 กุมภาพันธ์ 2550
วิชา 220-527 Geosynthetics Engineering

ปีการศึกษา 2549
เวลา 13.30-16.30 น.
ห้องสอบ A205

ข้อกำหนด:

1. ข้อสอบ มี 5 ข้อ คะแนนเต็ม 40 คะแนน ให้ทำทุกข้อ
2. ให้นำสมุด Lecture, Sheet และ หนังสือ เข้าห้องสอบได้
3. ให้นำเครื่องคิดเลขทุกชนิดเข้าห้องสอบได้

ออกข้อสอบโดย
ดร. พิพัฒน์ ทองฉิม
15 กุมภาพันธ์ 2550

1. A Geonet is being considered for primary leachate collection on the 1,000 ft.-long landfill is 12 % slope and the landfill when complete will be 150 ft. high with a unit weight of waste of 100 lb./ft.³ Using the data of Figure 4.7. The sum of partial factors of safety should be 9. The required transmissivity is 0.14 ft.³/min./ft.

1.1 Determine the allowable transmissivity. (3 points)

1.2 Determine the global factor of safety. (3 points)

2. Determine the factor of safety against sliding of a uniform soil cover on an HDPE geomembrane covering a 3 (H) to 1 (V) slope 40 ft. deep. The thickness of a uniform soil cover is 12 in. Given the following set of data from direct shear tests of an HDPE geomembrane on a concrete sand show below

Normal Stress (lb/in. ²)	5.0	10.0	15.0	20.0
Shear strength (lb/in. ²)	1.8	3.7	5.9	7.7

(4 points)

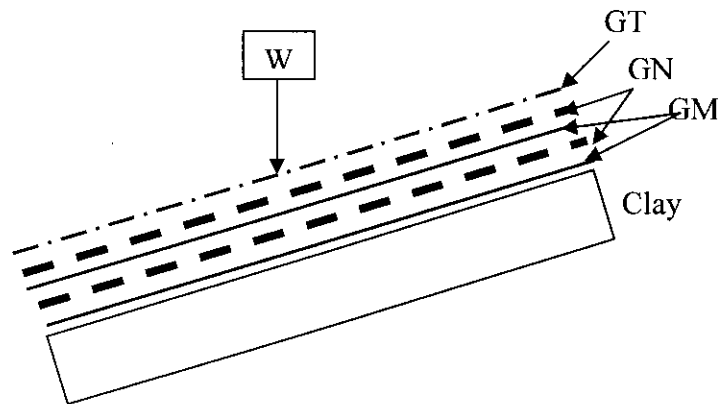
3. Calculate the shear stresses and tensile forces on each of the interfaces of the components shown in the multilayer liner system on the slope of a landfill in the following sketch. The slope is 3H:1V with a 10-ft lift height of waste weighing 80 lb./ft.^3 . The components and friction angles are follow :

- Friction angle of waste = 38 deg.
- Geotextile (needle-punch nonwoven): GT to GN, $\delta = 35 \text{ deg.}$
- Geonet (3/8 in. thick-foamed): GN to GM, $\delta = 11 \text{ deg.}$
- Geomembrane (60-mil HDPE): GM to GN, $\delta = 15 \text{ deg}$
- Geonet (1/4 in. thick-solid): GN to GM, $\delta = 13 \text{ deg.}$
- Geomembrane (45-mil HDPE): GM to clay, $\delta=10 \text{ deg.}$

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

- Geonet-foamed: $1,250 \text{ lb./in.}^2$
- Geonet-solid : $1,575 \text{ lb./in.}^2$
- Geomembrane- HDPE: 2200 lb./in.^2

(10 points)



4. 4.1 Calculate the water flux ratio of a GCL-to-CCL for total hydraulic head of 2 m., 1.5 m., 1.0 m., 0.5 m., and 0.3 m. The permeability of GCL is 5×10^{-9} cm/sec. and it is 6 mm. thick.

A CCL which is 50 cm thick having a permeability of CCL is 1×10^{-7} cm/sec. and plot the response of each calculation accordingly. (5 points)

4.2 What is the flow rate (water flux) through an intact GCL having a permeability of 5×10^{-10} cm/sec. under 30 cm. of total head difference if it is originally 2.0 cm. thick? What is it if it has been "thinned" during construction and placement to 1.5 cm., then 1.0 cm., then 0.50 cm, then 0.25 cm.? Plot the resulting response curve. (5 points)

5. Consider a 500×1000 ft.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 3 % for both header and feeder pipes. The landfill is located in an area with a rainfall intensity of 100 mm./hr. for a 10-year rainfall intensity. Given $h_c = 1.0$ ft. and $k = 2.5$ ft/min.

5.1 Determine the pipe spacing. (4 points)

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