University Examinations 2013/2014

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

ECV 0230: SOIL MECHANIC II

DATE: APRIL 2014   **TIME: 1 ½ HOURS**

INSTRUCTIONS: *Answer question **one** and any other **two** questions*

QUESTION ONE – (30 MARKS)

(a) Define the following;
  (i)   Consolidated undrained test
  (ii)   Shear strength
  (iii) Slope stability   (3 Marks)

(b) During subsurface exploration at a new roadway embankment soil samples were collected from a CL soil layer. The results of the CD triaxial testing for the soils were presented as below.

Test	Minor principal stress at failure T' (ps)	Major principal stress at failure T (ps)
1	5	23
2	10	38.5
3	15	53.6

Determine the effective and total Mohr-Coulomb failure of the soil.   (5 Marks)

(c) In each case, stating an advantage and disadvantage briefly explain the methods of determine shear strength.   (6 Marks)

(d) A uu test carried on a saturated normally consolidated clay sample at a confining pressure of 3kg/cm. The deviator stress at failure was 1kg/cm
    (i)   Determine its total strength parameters.   (2 Marks)
    (ii)   If another identical sample was tested at confining pressure of 4kg/cm determine the vertical axial stress at failure.   (2 Marks)

(e) Briefly explain any three methods of analysis slope stability.   (9 Marks)

(f) State any three causes of failure in retaining walls.   (3 Marks)

QUESTION TWO – (15 MARKS)

(a) Results of a test conducted on two saturated clay sample are give below. Determine the shear strength parameter of the soil

	Sample 1	Sample 2
Confining pressure	4.8kg/cm	6.3kg/cm
Axial stress at failure	6.8kg/cm	9.3kg/cm
Pore water pressure at failure	3.8kg/cm	4.8kg/cm

(b) State the significance of shear strength to a civil engineer.   (3 Marks)

(c) Soil from a local contractor soil pit is proposed for use as backfill behind a mechanically stabilized earth dam for a local project. The project specification requires that the backfill material to have a minimum residual soil friction angle of 32° at the required compaction (95 % modified procto). The results from the direct testing performed at the minimum required compaction by a local testing firm are as shown below:

Test	confining stress σ (psi)	shear stress peak	i (psi) residual
1	14.4	5.5	4.4
2	17.5	14.0	11.8
3	23.1	18.4	17.0

    (i)   Determine the peak and residual friction angle to the soil.   (4 Marks)
    (ii)   Determine if the soil meets the project specification   (1 Mark)
    (iii)   Explain density of the soil based on direct shear results   (2 Marks)

QUESTION THREE – (15 MARKS)

(a) State the following theories:
    (i)   Mohr – Columb theory
    (ii)   Rankin theory   (2 Marks)

(b) Explain four engineering and structures methods of stability slopes.   (8 Marks)

(c) The following results were obtained on two saturated soil sample.

	Sample 1	Sample 2
Confining pressure	3.8	5.4
Axial stress at failure	5.8	9.2
Pore water pressure at failure	2.4	4.4

Determine
(i)   Friction force
(ii)   Cohesion of soil   (5 Marks)

QUESTION FOUR – (15 MARKS)

(a) Briefly explain any three methods of dealing with deep seated mass failure in soils.
                                                                                          (6 Marks)
(b) A region residential building contractor is planning on building a custom 3700fts home. The subsurface investigation for the house site shows the poorly graded sand deposit exists from ground surface to a depth of 15ft. Density testing on the sand insitu yielded an average moist weight pcf at an average moisture contentof 12%. Determine the shear parameters for use in a prelimary shallow foundation design.   (5 Marks)
(c) Briefly explain any two factors that affect formation of tropical.   (4 Marks)