ET-501(A)

02262

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2011

ET-501(A) : SOIL MECHANICS

Time : 3 hours   *Maximum Marks : 70*

Note : *Answer **any five** questions. Assume any missing data. Use of scientific calculator is **permitted**.*

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1. (a) Derive the relationship.   7
        $Se = mGs$.

    (b) A soil is saturated at 48% moisture content   7
        and has a unit weight of 17.8 kN/m^3.
        Calculate its voids ratio, specific gravity, dry
        unit weight and submerged unit weight.

2. (a) What are different types of soil structures   7
        which can occur in nature ? Describe in
        brief.

    (b) A soil has liquid limit and plastic limit of   7
        47% and 33% respectively. If the volumetric
        shrinkages at the liquid limit and plastic
        limit are 44% and 29%, determine the
        shrinkage limit.

3. (a) Discuss measurement of permeability in the   7
        field.

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(b) In a constant head permea meter test, the 7
following Observations were taken.

Distance between piezometer tappings = 100 mm.

Difference of water levels in piezometers = 60 mm.

Diameter of the test sample = 100 mm.

Quantity of water collected = 350 ml.

Duration of the test = 270 seconds.

Determine coefficient of permeability of soil.

4. (a) Discuss standard proctor compaction test 7
and Modified proctor compaction test.

(b) The following are the results of a standard 7
proctor compaction test performed on a
sample of soil :

Water (%) content	7.7	11.5	14.6	17.5	19.7	21.2
Mass of wet soil (kg)	1.7	1.89	2.03	1.99	1.96	1.92

Volume of mould = 950 cc, G = 2.65.

Make necessary calculations and Plot the
water content-dry density curve and obtain
maximum dry density and the optimum
moisture content.

5. (a) What is a flow net ? What are the principles 6
of drawing flow nets and give examples ?

(b) What is the significance of uplift pressure 3
under a hydraulic structure ?

(c) What is quicks and condition ? Explain with 5
a suitable example.

6. (a) Discuss Newmark's influence chart. 7

(b) A concentrated load of 2000 kN is applied 7
at the ground surface. Determine the
vertical stress at a point P which is 6 m
directly below the load. Also calculate the
vertical stress at a point R which is at a depth
of 6 m but at a horizontal distance of 5 m
from the axis of the load.

7. (a) Describe types of slopes and slopes failures. 7

(b) Compute the secondary compression index 7
using the following data :

$d_0 = 6.80$ mm $d_{100} = 4.48$ mm

$d_f = 4.13$ mm

$t_{100} = 90$ min $t_f = 1440$ min

$e_0 = 2.10$ $e_f = 1.75$

8. Write short notes on *any four* of the following :

(a) Factors affecting permeability. $4 \times 3\frac{1}{2} = 14$

(b) Grain size distribution curve.

(c) Direct shear test of soil.

(d) Total stress, pore water pressure and effective stress of soil.

(e) Applications of shear strength of soil

(f) Determination of coefficient of consolidation.

(g) Consistency limits.