

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

Term-End Examination

June, 2010

ET-501(A) : SOIL MECHANICS

02417

Time : 3 hours

Maximum Marks : 70

*Note : Answer any five questions. Assume any missing data.
Use of calculator is permitted. Notations used in the
questions carry their usual meaning.*

1. (a) Explain how the specific gravity of a soil is determined ? What are the factors affecting it ? 7
- (b) A sample of fine grained soil was taken from a site which was found to be partially saturated. The test results are as follows : 7
- Wet weight of the sample = 250 gm
- Dry weight of the sample = 210 gm
- Volume of the sample = 150 cc
- Determine the air content in the soil. The specific gravity of the soil is 2.65.

2. (a) What do you mean by structures of cohesionless soils and cohesive soils ? Explain with neat sketches. 7
- (b) A soil sample has a liquid limit and plastic limit as 24% and 16% respectively. The results of sieve analysis are as follows : 7

sieve size (mm)	% passing
2.0	100%
0.425	85%
0.075	40%

Classify the soil.

3. (a) What is the principle of effective stress ? Explain the influence of pore water pressure on the behaviour of soil. 7
- (b) A soil below the ground level consists of sand with porosity 45% and specific gravity 2.65. The water table is 5 m below the ground level. The soil is saturated above the water table upto a height of 1 m due to capillary action. The degree of saturation of the first 4 m of moist sand below the ground level is 12%. Find the effective stress at a depth of 10 m below the ground level. 7

4. (a) Why the maximum dry density of a soil obtained by modified proctor's test is more as compared to that of standard proctor's test ? Explain. 7

(b) The standard proctor's test on a soil gave following results. Draw compaction curve & zero air void line and find QMC and MDD. 7

water content %	12	14	16	18	20	22	24
wet unit weight kN/m ³	16.5	17.7	18.8	19.9	20.2	20.7	21.0

5. (a) What is a flownet ? How is it drawn graphically ? Write the assumptions used. 7

(b) An earth dam is built on an impervious foundation with a horizontal filter at the base and near the toe. The full reservoir level is 30 m above the filter. A flownet constructed for the transformed section of the dam consists of 5 flow channels and 20 equipotential drops. Determine the seepage loss per meter length of the dam if the coefficients of permeability in horizontal and vertical directions are 4×10^{-4} cm/sec and 2×10^{-4} cm/sec respectively. 7

6. (a) How is the vertical stress at any depth estimated due to uniformly loaded rectangular area ? 7
- (b) A circular foundation on the ground surface carries an uniformly distributed load of 150 kN/m^2 . The radius of the foundation is 5 m. Determine the vertical normal stress at a depth 8 m below the centre of circular foundation. Use Boussinesq's theory. 7
7. (a) What is the difference between normally consolidated and pre-consolidated clay ? How the preconsolidation pressure is determined ? 7
- (b) Under a certain loading a layer of clay is expected to undergo full settlement of 150 mm. It is expected to settle by 40 mm in the period of first three months of loading. Find the time required for the clay layer to settle by 100 mm. 7
8. (a) What is shear strength of a soil ? 7

A series of shear tests were performed on a soil. The results are as below :

Test No	σ_3 (kN/m ²)	σ_1 (kN/m ²)
1	200	500
2	300	1000
3	400	1300

Draw Mohr's circle and find shear parameters.

(b) What is Taylor's stability number ? Discuss various factors affecting stability analysis. 7
