

FACULTY OF ENGINEERING

B.E. III/IV Year (Civil) II Semester (Main) Examination, May/June 2011

SOIL MECHANICS

Time : 3 Hours]

[Max. Marks : 75

Answer **all** questions from Part A.
Answer any **five** questions from Part B.

Part A – (Marks: 25)

1. "True Specific Gravity determined in the laboratory at 48°C is always less than that found at 8°C". Answer yes or no and justify your answer. (2)
2. Differentiate "Coefficient of Permeability" with "Coefficient of Percolation". Which of these is always higher than the other and Why? (2)
3. Sketch the typical moisture-density curve for a well graded and poorly graded soil of similar type and comment on the effect of gradation on MDD, OMC. (2)
4. Differentiate a "UU test" with "CD test". Which of these provide effective shear parameters? (2)
5. Describe factor of safety against overturning of a gravity retaining wall? What is its limit for stability? (2)
6. Classify the soil mass having 4% retained on ISSQ.075mm with LL=42% and PI = 9. (2)
7. What is the "Capillary rise" of water at 4°C in a soil mass having average pore size 0.10 mm? (3)
8. The primary consolidation settlement of a 6m thick clay layer with single drainage is estimated as 90cm. Later it was found that, the medium has double drainage. Then, all other parameters remaining same, what will be the primary consolidation settlement? (3)
9. A cohesionless soil sample failed at a deviatoric stress of 80 kPa when the cell pressure was 50 kPa. Determine the shear parameters c , Φ . (3)
10. Determine the un-supported depth of excavation in a pure cohesive soil with unconfined compressive strength of 100 kPa. (3)

[P.T.O.]

Part B – (Marks: 5×10=50)

11. (a) Explain the laboratory procedure for determination of shrinkage limit and derive the expression for it. (5)
- (b) The following data was recorded in a core cutter method at a site.

Empty weight of the core sampler	=	1150 g
Wt. of core + insitu moist soil	=	3220 g
Volume of the sampler	=	945 cc
In-situ moisture content	=	9.6%
Specific gravity of solids	=	2.64

Determine (i) Void ratio (ii) Degree of Saturation (iii) Dry Density (iv) Saturation density (v) Density Index if maximum and minimum void ratios are 1.10 and 0.21. (5)

12. (a) Explain the mechanism involved in "Quick Sand Phenomena" and derive the expression for critical hydraulic gradient (5)
- (b) A flow net consists of 9 flow lines and 16 equi-potential lines. The total head causing flow is 12m. The average size of any field is 0.8m. However, the minimum size of any field at downstream end is 0.6m. The average permeability of soil is given as 3.6×10^{-3} cm/sec, Calculate (i) the discharge of seepage flow (ii) the exit gradient (5)

13. (a) The data from a IS Heavy Compaction test are as given below:

Wt..of soil in the compaction mould (g)	1710	1830	2160	2205	2235
Water Content (%)	4.40	5.70	7.30	9.10	12.40

Plot the moisture density curve, consider $G = 2.68$ and determine

- (i) MDD, OMC (6)
- (ii) Degree of saturation at MDD (4)
- (iii) Draw ZAV line (6)
- (b) Differentiate "consolidation process" with "Compaction process" (4)

14. (a) Explain the procedure of "Direct Shear Test" and its merits and demerits (5)

(b) The results of a CU bar triaxial compression test are as given below.

Sample No.	1	2
Confining stress (kPa)	40	90
Deviatoric Stress (kPa)	70	170
Pore Pressure (kPa)	(-) 5	(+) 25

Determine the effective shear parameters c' and Φ' . (5)

15. (a) Explain the Rebhan's graphical solution for determination of active earth pressure. (5)

(b) A 8m high retaining wall is supporting a $c-\Phi$ backfill having $c = 40 \text{ kN/sqm}$; $\Phi = 24^\circ$; $\gamma = 18.50 \text{ kN/cum}$. Plot the distribution of active and passive earth pressure and determine the magnitude and point of application of total active and passive earth pressure acting on the retaining wall. (5)

16. (a) Compare the "Swedish Slip Circle method" with "Method of slices".

(b) An excavation has to be made with an inclination of 40° in a soil with $c' = 40 \text{ kPa}$, $\Phi' = 10^\circ$ and $\gamma = 18 \text{ kN/cum}$. What is the maximum height of the slope with a factor of safety of 2.01. The Taylor's stability number for the above conditions is given as 0.097.

17. Write a detailed note on any **two** of the following:

- (i) Classification of soils for Engg. Purposes as per IS:1498-1970
- (ii) Permeability and the factors affecting it.
- (iii) Spring Analogy to describe Consolidation process
- (iv) Field compaction quality control