No. of Printed Pages : 4

ET-501(A)

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

Term-End Examination

June, 2013

ET-501(A) : SOIL MECHANICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Differentiate between : 8

(i) Percentage air voids and air content

(ii) Void ratio and porosity

(iii) Specific gravity of solids and mass specific gravity.

(iv) Saturated density and bulk density.

(b) A borrow area soil has a natural water content of 10% and a bulk density of 1.8 g/cc. The soil is used for an embankment to be compacted at 18% moisture content to a dry density of 1.85 g/cc. Determine the amount of water to be added to 1.0m^3 of borrow soil. How many cubic meters of excavation is required for 1m^3 of compacted embankment. 6

2. (a) Discuss Atterberg's Limits and their significance. 6

(b) Determine Shrinkage Limit and specific gravity of solids , if : 8

(i) Volume of saturated soil = 9.75 ml

(ii) Mass of saturated soil = 16.5g

(iii) Volume of dry soil after shrinkage = 5.40ml

(iv) Mass of dry soil after shrinkage =10.9g

3. (a) Discuss factors influencing Permeability. 6

(b) The falling head test was conducted on a soil sample of 4cm diameter and 18cm length. The head fall from 1.0 m to 0.4 m in 20 minutes. If the cross sectional area of the stand pipe was $1cm^2$, determine the coefficient of permeability. 8

4. (a) Discuss influence of pore water pressure on soil behaviour. 6

(b) Describe : 8

(i) Compaction

(ii) Tests to check degree of compaction at site

(iii) OMC & MOD

(iv) Zero air void line.

5. (a) Discuss the significance of potential and stream function. Define flow net. 6

(b) A soil profile consists of a surface layer of sand 3.5 m thick ($r = 1.65 g/cc$), an intermediate layer of clay 3m thick ($r = 1.95 g/cc$) and the bottom layer of gravel 3.5 m thick ($r = 1.925 g/cc$). The water table is at the upper surface of the clay layer. Determine the effective pressure at various levels immediately after placement of a surcharge load of 58.86 kN/m^2 to the ground surface. 8

6. (a) Calculate the vertical stress at a point P at a depth of 2.5 m directly under the centre of the circular area of radius 2m and subjected to a load $100 kN/m^2$. Also calculate the vertical stress at a point Q which is at the same depth of 2.5m but 2.5m away from the centre of the loaded area (Consider at $Z = 1.25R$ and $r = 1.25R$, Vertical stress is 0.29) 7

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

7. (a) Discuss primary consolidation and secondary consolidation. 7

(b) Estimate the Secondary compression settlement that might occur upto 60 yeras. The average stress change caused by the foundation loads over the thickness of the clay layer is approximately same as in the laboratory test. For the clay layer of 10m thick, sandwiched between sand layers at the top and bottom, the laboratory test on clay shows that $C_v = 0.226 \times 10^{-3} cm^2/sec$, void ratio at the end of the primary consolidation is 1.796 and e_f=1.75. 7

8. (a) Describe Direct shear test. What are its merits and demerits ? 7

(b) Discuss types of slope failures and factors causing instability. 7