

Mid-West University  
**Examinations Management Office**  
End Semester Examinations 2081

Bachelor level/ B.E. Civil/ 4<sup>th</sup> Semester

Time: 3 hours

Subject: Soil Mechanics (CE444/CE212)

Full Marks: 50

Pass Marks: 25

- Attempt all the questions
  - Figures in the margin indicate full marks.
  - Assume suitable values, with a stipulation, if necessary.
  - Candidates are required to answer the questions in their own words as far as possible.
1. What do you understand by soil mechanics and why do you need to study this? What would be a solution of different soil Engineering program? (3)
  2. Define coefficient of uniformity and coefficient of curvature. A Clay sample containing its natural moisture weighs 0.33 N. The specific gravity of solid of the soil is 2.7. After oven drying the soil sample weighs 0.2025 N. The volume of the moist sample before oven drying found by displacement of mercury is 24.5 m<sup>3</sup>. Determine the moisture content, void ratio and degree of saturation. (1+4)
  3. Compare soil classification by USCS and AASTHO. Classify the soil as per USCS. Soil passing from 75 micron = 85 %, LL = 64 %, PL = 25 %. (2+3)
  4. Explain the possible soil structures in the natural soil mass. (3)
  5. Write the objectives of compaction. The specific gravity of solid is 2.7, and the volume of the compaction mould is 1000 cm<sup>3</sup>. Plot the compaction curve and obtain the max. dry density and optimum water content from following data. (1+4)

Mass of soil (gms)	1320	1440	1570	1515	1480
Water contents (%)	8	11	12	14	16
  6. A sand deposit consists of two layers. The top layer is 3 m thick ( $\rho = 1800 \text{ kg/m}^3$ ) and the bottom layer is 4 m thick ( $\rho_{\text{sat}} = 2070 \text{ kg/m}^3$ ). The water table is at a depth of 4.5 m from the ground level, and the zone of capillary saturation is 1 m above the water table. Draw the diagram showing the stress variation of total stress, pore water stress and effective stress. (5)
  7. Derive the Laplace equation for two dimensional flow in soil. (4)
  8. Define isobar. An overhead water tank has a weight of 1800 KN is supported on a tower with 4 legs. The legs rest on a pier located at the corner of square with 7 m length. Determine the increase in vertical stress at a depth 5m below the centre of square. (4)
  9. Differentiate between compaction and consolidation. In the laboratory, test performed on a 25 mm thick undisturbed clay sample. 50% consolidation occurred in 5 minutes. Determine the coefficient of consolidation. But in real field the clay layer was found to be 2 m thick and was underlain by rock stratum. There was a sand layer above clay. Compute the number of days required for the field stratum to reach 50% consolidation. (2+5)
  10. Explain with figure the procedure of Tri- axial shear test. Enlist merits of over direct shear test method. (5)
  11. Write the causes of instability of slopes. Describe different modes of slope failure. (2+2)

**The End**