

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

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

Time: 3 hours

**Subject: Soil Mechanics (HE445/HE210)**

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. Explain the importance of soil mechanics in relation to different Engineering problem. Briefly describe how soils are formed. (3)
  2. Derive the relation between void ratio and porosity. (2)
  3. A 50 cc volume of moist soil weight 95gms. It's dry weight is 75gms and specific gravity of soil is 2.7. Compute the natural moisture content, void ratio, porosity and unit weight. (4)
  4. What are the purpose of soil classification? Classify the given soil as per USCS. (2+3)  
Soil passing from 75 micron = 65%, LL = 58%, PL = 27 %
  5. Describe clay minerals with neat sketches. (3)
  6. Plot the compaction curve and obtain the maximum dry density and optimum water content from the following results obtained from a standard compaction test. (4)  
The specific gravity of solid is 2.7, and the volume of the compaction mould is 1000cm<sup>3</sup>.
  7. A sand deposit consists of two layers. The top layer is 4 m thick ( $\rho = 18 \text{ KN/m}^3$ ) and the bottom layer is 5 m thick ( $\rho_{\text{sat}} = 22 \text{ KN/m}^3$ ). Draw the diagram showing the stress variation of total stress, pore water stress and effective stress at 7 m below the ground surface, if the water table is:

Mass of compacted soil (gm)	1920	2050	2140	2149	2121	2082
Water contents (%)	11	12	14	16	18	20

    - a) 1m below ground surface
    - b) Exactly above ground surface
    - c) 1m above ground surface (5)
  8. Define Flow net. Derive the Laplace equation for two dimensional flow in soil. (1+4)
  9. A water tower weighing 1500 KN is to be considered as a concentrated load, acting on the ground surface. Compute the vertical stress at a depth of 12m below the surface. Also compute the vertical stress at a distance of 7m away from a water tower. (4)
  10. In the lab, a 4 cm thick soil sample taken 30 minutes to reach 50 % degree of consolidation. Find the time taken for 4 m thick clay layer to reach 30 % and 75% consolidation. Clay lies between sand layer on top and bottom. Assume oedometer test is conducted in lab. (5)
  11. Define shear strength of the soil? Describe about Direct Shear test with merits and demerits. (5)
  12. Difference between finite and infinite slope. What are cause and remedial measures of slope instability? (2+3)

**The End**