GEO TECHNICAL ENGINEERING

CIVIL

SEMESTER – FIFTH

These important questions have been prepared using your previous exam papers (PYQs), verified concepts, and additional reference from trusted online academic sources.
For deeper understanding, please refer your class notes as well.

1️⃣ HIGH & LONG IMPORTANT QUESTIONS

1. Explain the **Three-Phase System** of soil with a neat sketch. Derive the relationship between:
   - Void Ratio (e), Porosity (n), and Degree of Saturation (S).
   - Bulk Unit Weight (gamma), Specific Gravity (G), Water Content (w), and Void Ratio (e).
2. Explain the procedure to determine the dry density of soil in the field by:
   - **Core Cutter Method** (Draw diagram).
   - **Sand Replacement Method** (Draw diagram).
3. Define Rock. Explain the classification of rocks based on their geological formation (Igneous, Sedimentary, and Metamorphic rocks) with examples.
4. State **Darcy's Law** of permeability. Explain the laboratory procedure to determine the coefficient of permeability by:
   - **Constant Head Method.**
   - **Falling Head Method.**
5. Explain the **Standard Proctor Test** to determine OMC (Optimum Moisture Content) and MDD (Maximum Dry Density) with a neat sketch of the compaction curve.
6. Explain **Mohr-Coulomb's Law** of shear strength. Draw the strength envelope for:
   - Purely cohesive soil (C-soil).
   - Purely frictional soil (phi-soil).

- c-phi soil.

7. Describe the procedure of the **Plate Load Test** for determining the bearing capacity of soil. What are its limitations?
8. Explain the procedure of the **Direct Shear Test** with a neat diagram. (Prepare for a simple numerical on this as per syllabus).
9. What is the necessity of site investigation? Explain the **Standard Penetration Test (SPT)** procedure.
10. Differentiate between **Compaction and Consolidation**.

2️⃣ IMPORTANT & SHORT QUESTIONS

1. **Definitions (Unit 2 - Very Imp):** Define the following terms:
   - Water Content
   - Void Ratio & Porosity
   - Degree of Saturation
   - Density Index
   - Specific Gravity
2. **Atterberg's Limits:** Define Consistency of soil. Explain Liquid Limit, Plastic Limit, and Plasticity Index.
3. **Particle Size:** Explain the **Particle Size Distribution Curve**. What is D10, D30, and D60? Define Uniformity Coefficient (C_u) and Coefficient of Curvature (C_c).
4. **Earth Pressure:** Define Earth Pressure. Explain:
   - Active Earth Pressure
   - Passive Earth Pressure
   - Earth Pressure at Rest.
5. **Bearing Capacity Terms:** Define Ultimate Bearing Capacity, Net Safe Bearing Capacity, and Allowable Bearing Pressure.
6. **Shear Failures:** What are the different types of shear failure in soil? (General, Local, and Punching shear failure).
7. **Geotech Scope:** Write a short note on the importance/application of Geotechnical Engineering in Civil Engineering (Dams, Roads, Foundations).
8. **Stabilization:** What is Soil Stabilization? Why is it necessary?

9. **Factors Affecting:**
    - Factors affecting Permeability.
    - Factors affecting Compaction.
10. **Rankine's Theory:** State the assumptions of Rankine's theory of earth pressure.

3️⃣ "AA BHI SAKTA HAI" QUESTIONS

1. What is a Flow Net? State the uses/applications of a flow net (Seepage pressure, Phreatic line).
2. What is the California Bearing Ratio (CBR) test? How is the CBR value interpreted for pavement design?
3. Write down the assumptions made in Terzaghi's Bearing Capacity analysis.
4. Briefly explain the Vane Shear Test (used for soft clays).
5. How do you identify soil in the field? (Dry strength test, Dilatancy test, Toughness test).
6. Brief note on the Composition of Earth (Crust, Mantle, Core).
7. Give engineering uses of Granite, Basalt, and Limestone.
8. Explain the concept of the Zero Air Voids line in compaction.

💡 Tips for JUT Exam:

- **Diagrams are King:** In Geotech, even if the question doesn't ask, draw the diagram (e.g., Phase diagram, Proctor curve, Mohr circle).
- **Formulas:** Memorize the relationships in Unit 2 (e.g., Se = wG). Often a simple 2-mark numerical comes from here.
- **Focus on Procedures:** For tests (Core cutter, Proctor, Plate load), write the answer in steps: *Aim -> Apparatus -> Procedure -> Formula -> Result*.