Ministry of Higher Education and Scientific research

Question bank for soil engineering

Department of Soil and Water Sciences

College of Agricultural Engineering sciences

University of Salahaddin-Erbil

Subject: Soil Engineering

Course Book – *For* (3rd year students)

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Q1) Calculate plasticity index and **description the soil for the following information**

1-plastic limit is 27%

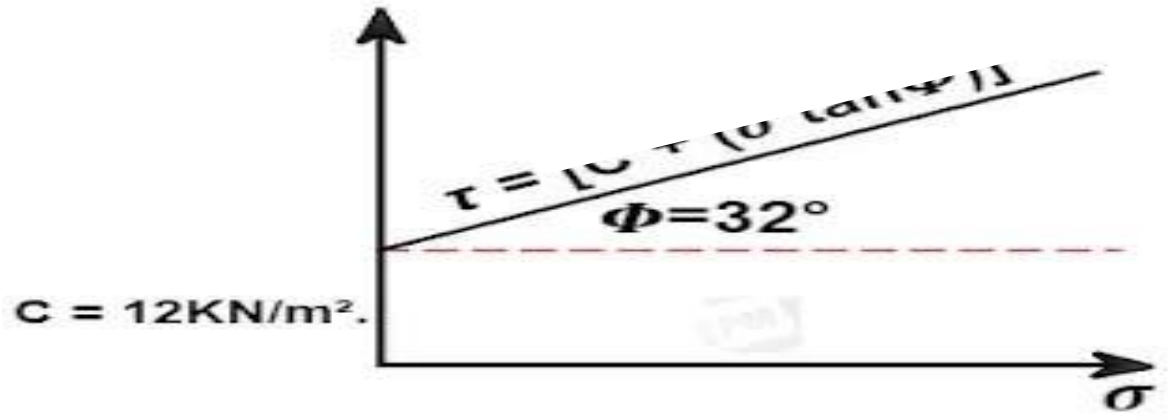
2-liquid limit is 35%

Q2/ What is a soil engineer and what are Among properties of soils highly important in engineering? Explain briefly

Q3/Numerus scope of soil engineering explain that

Q4/ A soil has void ratio = 0.72, moisture content = 12% and G_s= 2.72. Determine its
(a) Dry unit weight
(b) Moist unit weight, and the
(c) Amount of water to be added per m^3 to make it saturated.
Use $\gamma_w = 9.81 kN/m^3$

Q5/A/ what is shear strength and calculate shear strength of soil for the following curve if you know normal stress σ is 22KN/m².



Answer key

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Q1

Q2/ The job of a soil engineer is to analyze the soil structure of a proposed building or construction site and to understand problems of existing structures due to conditions of the ground underneath them. To learn more about the field of soil engineering, as well as the education and licensing required, read on. A soil engineer, also known as a soils engineer or a geotechnical engineer, is a civil engineer who specializes in evaluating the characteristics of the ground upon which a structure is built. A soil engineer investigates and analyzes a site for such qualities as soil characteristics, composition, and drainage. Soil engineers also consider the weight-bearing capacity of the ground under a building's foundation. They evaluate the likelihood that the building will settle or shift over time.

Q3/**Among properties of soils highly important in engineering are:**

1- **Permeability. 2-Strength. 3-Compaction characteristics. 4-Drainage.**

5-Shrink-swell potential. 6-Grain size. 7-Plasticity, and reaction.

8-Depth to the water table. 9-Depth to bedrock. 10-Soil slopes.

Soil engineering properties, considered broadly, are physical, chemical, and biological characteristics that are observable, measurable, and influence behavior to the extent that they are important in engineering analyses and design, and in performance of components, systems, or processes

Q4/ **Scope of Soil Engineering**

The scope of soil engineering in the construction field is very vast because all the civil engineering structures are lies on or below the surface of the soil.

Here is a list of the scope of soil engineering in the field of the construction industry-

1- Foundations

Soil engineering helps us to determine the strength of soil and also helps us to decide which type of foundations are required to sustain the structure. The goal is to ensure that the foundation can support the structural loads while considering soil conditions and potential settlement.

2- Retaining Structures

Soil engineering helps us to determine which type of retaining structure (such as walls, dams, barriers, or bins) is suitable for the hold Earth materials or water

3- Slopes Stability

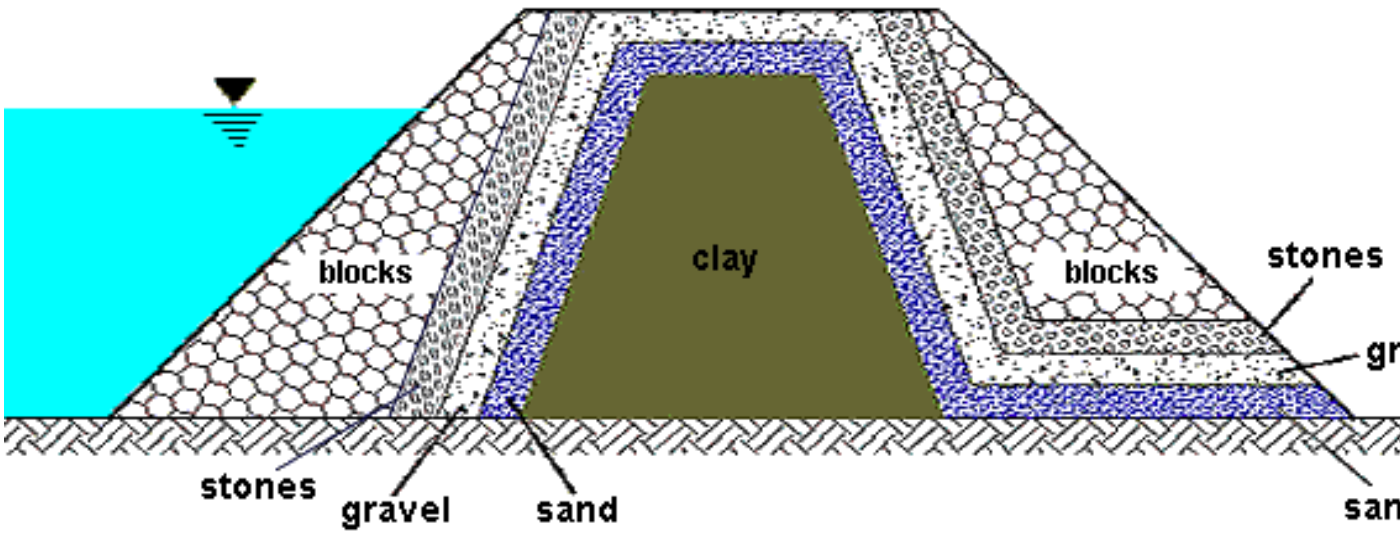
Soil engineering provides us with various methods for checking the stability of slopes and gives the idea to stop slope failure. Soil engineers evaluate factors like soil type, slope angle, and groundwater conditions to determine the stability of slopes. Soil engineers evaluate factors like soil type, slope angle, and groundwater conditions to determine the stability of slopes.

4- Underground Structures

Soil engineering helps us to determine the strength of forces exerted by the soil on underground structures.

5- Earth Dam

deep knowledge of the properties of the soils is required while constructing the earth dam. An earth dam is a type of dam constructed primarily with natural materials such as soil, sand, clay, or rock. It is designed to impound water and create a reservoir or pond behind the dam. Earth dams are widely used for water storage, flood control, irrigation, hydropower generation, and other water-related purposes.



6- Pavement Design

Q/ ***Solution:***

(a) $\gamma_d = \frac{G_s.\gamma_w}{1+e} = \frac{2.72\ x\ 9.81}{1+0.72}$ = 15.51 kN/m^3

(b) $\gamma = \gamma_d(1+w)$

$= \frac{1+0.12}{1+0.72}\ x\ 2.12\ x\ 9.81$ = 17.38 kN/m^3

(c) $\gamma_{sat} = \frac{G_s+e}{1+e}.\gamma_w$

$= \frac{2.72+0.72}{1+0.72} x\ 9.81$ = 19.62 kN/m^3

Water to be added per m^3 to make the soil saturated

$= \gamma_{sat} - \gamma$ = 19.62 – 17.38 = 2.24 kN