RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B. Sc. (General) Degree in Applied Sciences
Third Year - Semester I Examination – November / December 2016

PHY 3206 – SOIL PHYSICS

Time: 2 hours

Answer FOUR questions only
The use of a non-programmable calculator is permitted.

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1. (a) What is "saturated water flow" in soil? [05 marks]

   (b) Define the Darcy's law for saturated water flow, clearly identifying the quantities involved. [05 marks]

   (c) Discuss the Falling Head Method, used to determine the saturated hydraulic conductivity of relatively impermeable soils. [15 marks]

2. (a) What are the different ways of defining the soil density? [04 marks]

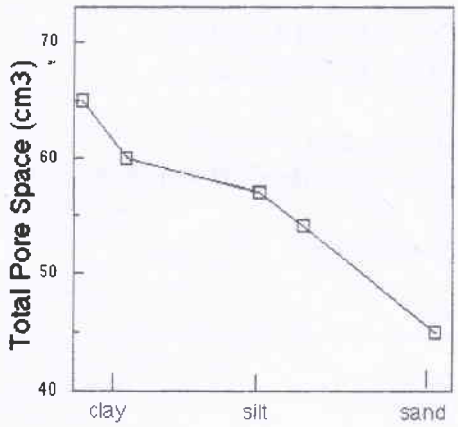
   (b) (i) Distinguish between "particle density" and "bulk density" of soil. [02 marks]

   (ii) Explain why the particle density remains constant while the bulk density keeps on increasing upon the compaction of a given soil sample. [04 marks]

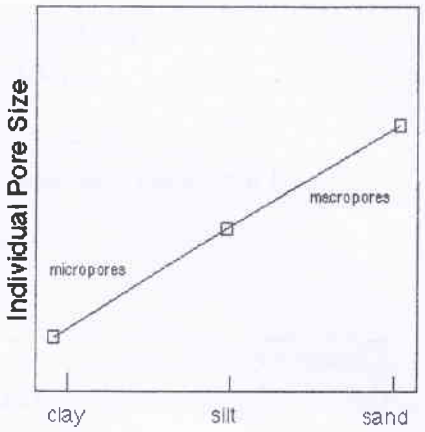
   (iii) Calculate the total porosity of a soil sample which has a bulk density (without water) of 1.35 g/cm^3. Assume that the particle density is 2.65 g/cm^3. [05 marks]

   (c) Explain "soil texture" and "soil structure". Why are they so important in seed germination and seedling emergence? [05 marks]

   (d) Discuss the two graphs given below *(Hint: the total pore space increases with increasing surface area of soil)*. [05 marks]



Graph I



Graph II

3. (a) What are the different types of water present in soil? Explain each of them in detail. [05 marks]

(b) Distinguish between "available soil water" and "non available soil water" as far as the plant growth is concerned. [05 marks]

(c) "*The field capacity is high in heavy soils which are rich in clay particles*" Explain the above statement. [05 marks]

(d) Discuss a simple method to determine the "field capacity" of a given soil sample. [10 marks]

4. (a) What is shear strength of soil? [05 marks]

(b) Construct the Mohr's circle of an element of soil subjected to minor and major principal stresses σ_x and σ_y ($\sigma_x < \sigma_y$). [10 marks]

(c) Explain the "direct shear test" used to determine the "apparent cohesion" and the "angle of shearing resistance" of a given soil sample. [10 marks]

5. Write short notes on the following.

(i) Matric potential of soil. [07 marks]

(ii) Soil forming factors. [06 marks]

(iii) Soil puddling. [06 marks]

(iv) Biological weathering. [06 marks]

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