The Open University of Sri Lanka

Faculty of Engineering Technology

Final Examination- 2005

AEX3231 Soil Management Tillage and Traction

AED2210 Cultivation and Soil Management

Date : 13-03-2006
Time : 0930 - 1230
Duration : Three (03) hours

Section 2

1. (a) Briefly explain the meaning of management of soil in agriculture.

   (b) Explain the terms, soil structure and soil texture

   (c) What are the factors that affect the soil temperature? How could the soil temperature be controlled, at least to a certain extent, to meet the crop requirements.

2. (a) Explain with the aid of Mohr's stress circle and Coulomb equation how the failure is predicted when a sample of soil is subjected to two principal stresses σ_1 and σ_2 ($\sigma_1 > \sigma_2$).

   (b) Show on the Mohr's stress circle the stress points corresponding to maximum shear plane and failure plane. Determine the angle between shear plane and the plane carrying the stress $\sigma 1$.

   (c) If $\sigma_1 = 40$, $\sigma_2 = 20$ and the soil is cohesionless, find the angle of internal friction if the failure sets in under these stresses.

3. (a) State the characteristics of tropical environment that affect the agricultural yields.

   (b) What are the features of agro-forestry?

   (c) What are the consequences of growing other filed crops in a rice field?

4. (a) What are meanings of soil bulk strength and clod strength?

   (b) Show, using sketches, how clod strength and bulk strength vary with the soil moisture content

(c) Describe how the soil moisture content could be made use of in controlling the tilth obtainable in tillage.

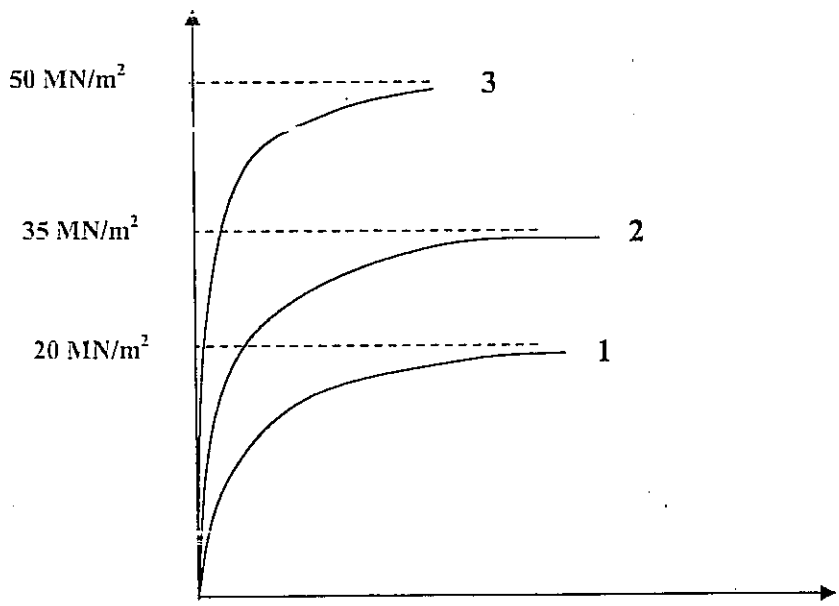
5. (a) What are the features that characterise a traditional rice field? Explain the importance of preserving these characteristics.

(b) Describe how maintenance of standing water and economical use are ensured in rice cultivation.

(c) What are the methods that could be used to enhance the traction of a tractor in a farm?

6. (a) Draw a line diagram to show the experimental set up to find the soil properties, **cohesion** and **angle of internal friction** of soil using direct shear box method. The parameters to be measured and instruments used should be indicated.

(b) The following curves were obtained by plotting the data obtained for three tests carried out with different normal loads using the experiment in (a).



Curves 1, 2 and 3 correspond to normal loads of 5kg, 10kg and 15kg. The cross sectional area of the soil sample is 0.002m².

(a) Name the axes of above plot of data.

(b) Tabulate normal stress values and corresponding shear strength values

(c) Find out cohesion and angle of internal friction of the soil sample used.