Answer all questions. Any missing data to be reasonably assumed

Question 1

a) **Make a comparison** between fine soil and coarse soil.

b) **Define** : **(i)** Void ratio, **(ii)** Porosity, **(iii)** Degree of saturation, **(iv)** Water content, **(v)** Dry unit weight, **(vi)** Wet unit weight, **(vii)** Submerged unit weight, **(ix)** Total Stress, **(x)** Effective Stress, **(xi)** Relative Density

c) The unit weight of a soil sample is 1.85 gm/cm^3 and its water content is 19.2%. If the unit weight of solid particles is 2.66 gm/cm^3, **find** the void ratio and degree of saturation.

Question 2

a) **Explain briefly** the tests used to determine the wet unit weight in the field.

b) **Define the following terms** liquid limit, plastic limit, shrinkage limit, and plasticity index, what type of soils would you expect to have a very large plasticity index?

c) The following charts of grain size analysis Fig.1 **Find** percentage of Gravel, Sand, Silt, Clay, and determine the effective diameter.

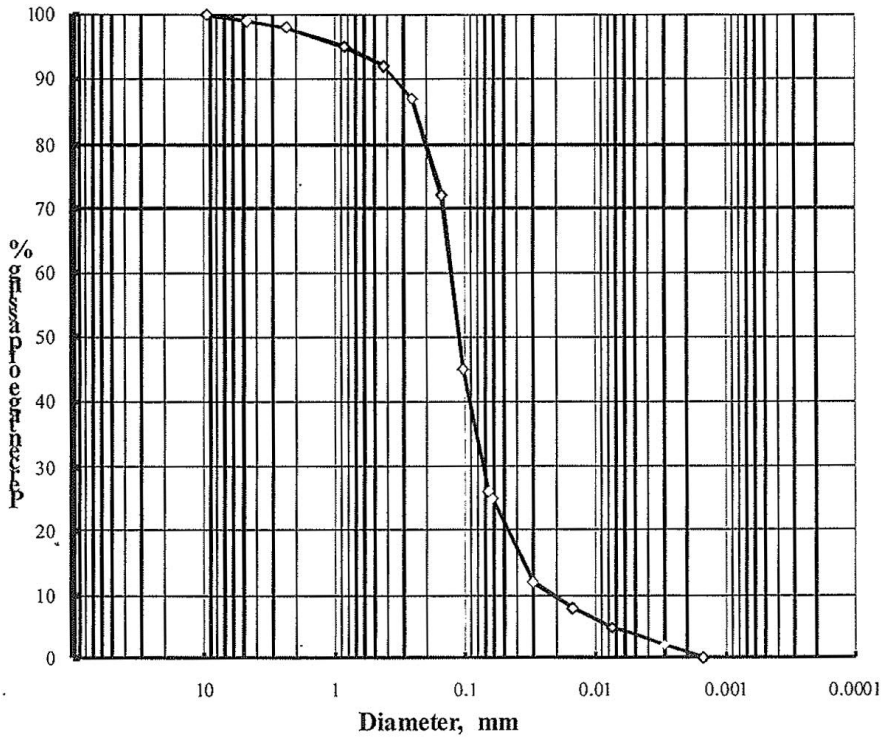

Fig.1

Question 3

a) For the soil profile shown in Fig. 2, find the total vertical stress and vertical effective stress at points A, B and C.

b) A square footing shown in **Fig 3** supports a column load of 80 ton. Determine the vertical stress under the centre of the footing at depth of 2.0, 3.0, 4.0 and 5.0 m.

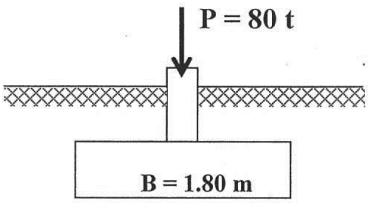

Fig. 3

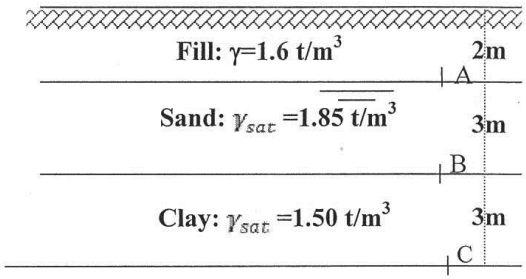

Fig. 2

Question 4

a) **Show with clear sketches** the types of shallow foundations.

b) **Design a rectangular footing** which supports a rectangular column 40x60 carrying 120 t. The net allowable soil pressure is 1.80 kg/cm^2, D_f=2.0 m, q_{sh}=4.50 kg/cm^2 for footing, q_{cp}=9 0 kg/cm^2. Use plain concrete thickness 50.0 cm

c) Without any calculations **draw the details of reinforcement** for the sections in footings shown in Fig. 3 focusing on main reinforcement.

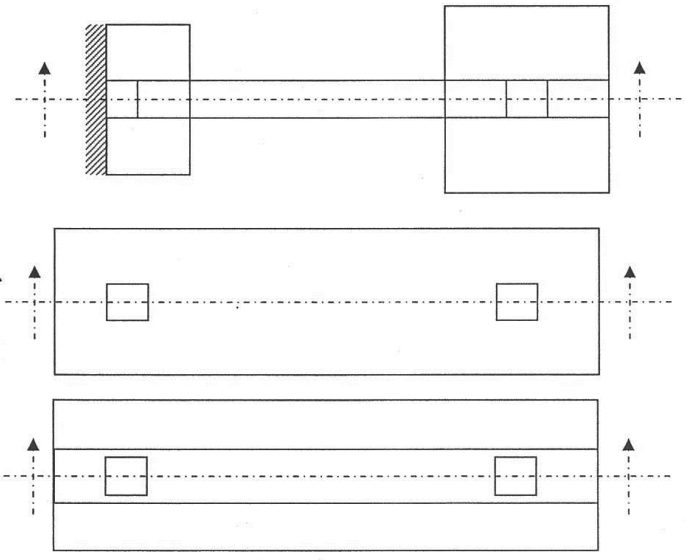

Fig. 4.a

Fig. 4.b

Fig. 4.c

Fig. 4

Best Wishes *DR Ali Mohammed Basha*