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BCE-046

DIPLOMA IN CIVIL ENGINEERING
DCLEC(G)

Term-End Examination

December, 2014

00805

BCE-046 : SOIL MECHANICS AND FOUNDATION ENGINEERING

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions out of the following. Notations given have their usual meanings. All questions carry equal marks.*

1. (a) Derive the relationship between γ_{sat}, γ_{bulk}, γ_{dry} and S. 7

(b) A soil sample is partially saturated. Its natural water content is found to be 20% and bulk density 21 kN/m^3. If the specific gravity of the solid particles is 2·7 and the unit weight of water is 10 kN/m^3, find out the degree of saturation and void ratio. 7

2. (a) Discuss the particle size classification as per IS : 1498 – 1970. 7

(b) A sample of sand has a volume of 1050 cc in its natural state. On drying and compaction by vibration, its minimum volume is 900 cc. When gently poured in a measuring cylinder, the maximum volume is 1400 cc. Find the relative density. 7

3. (a) What do you mean by permeability ? Discuss the factors affecting permeability. 7

(b) A sand deposit is made up of three horizontal layers of equal thickness. The permeability of top, middle and bottom layers is 2×10^{-5} mm/sec, 3×10^{-5} mm/sec and $3{\cdot}5 \times 10^{-3}$ mm/sec respectively. Find the equivalent permeability in the vertical direction. 7

4. (a) Discuss the various drainage conditions during measurement of shear strength. Also simulate the drainage conditions with actual geotechnical problems. 7

(b) A vane 100 mm in diameter and 200 mm in height, was pressed into soft clay in a borehole. The torque was applied and gradually increased to 100 N-m when failure took place. Determine the undrained shear strength. 7

5. (a) Briefly describe the field determination of soil density. *7*

(b) The results of Standard Proctor Test on a medium grained sandy soil are as follows :

Moisture content (%)	Wet unit weight (kN/m^3)
6·76	20·94
8·5	22·48
9·39	22·29
11·07	21·37
11·94	20·82

$G_s = 2{\cdot}65$; $\gamma_w = 10\ kN/m^3$.

Plot the data and determine the optimum moisture content and maximum dry density. *7*

6. (a) Discuss the various properties of soil affected by disturbance during sampling. *7*

(b) Describe the seismic refraction method for soil exploration. *7*

7. A square footing having a size of 2 m × 2 m has to transmit the load of a column at a depth of 1·8 m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. The soil has the following properties : $C = 10\ kN/m^2$; $\gamma = 18\ kN/m^3$; $\phi = 30°$; $N_c = 30{\cdot}14$; $N_q = 18{\cdot}40$; $N_\gamma = 22{\cdot}40$.

Use IS code method. *14*

8. (a) Enumerate the various types of foundations and discuss the applicability of Mat foundation. 7

(b) A precast concrete pile is being driven with a 50 kN hammer having a free fall of 1·0 m. If the penetration in the last blow is 6 mm, determine the allowable load carrying capacity of the pile according to Engineering News Record Formula. 7