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SF-6447

B. E. II (Sem. IV) (Civil) Examination

May / June – 2011

Geotechnical Engineering - I

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 2 (Sem. 4) (Civil)**

Name of the Subject :

☛ **Geotechnical Engineering - 1**

☛ Subject Code No. : **6 4 4 7** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Assume suitable data, if necessary.

(3) Figures to the right indicate full marks.

(4) Explain with neat sketches, if needed.

1 (a) All questions are compulsory : **10**

(i) Soils which are transported by ice is called

(a) Aeolin soils

(b) Alluvial soils

(c) Marine soils

(d) Glacial soil

(ii) The ratio of volume of air voids to volume of void is known as

(a) air content

(b) percentage air voids

(c) between 0 and 1

(d) greater than zero

(iii) Void ratio of a soil e can be

(a) never greater than one

(b) equal to zero

(c) greater than zero

(d) between 0 and 1

(iv) Coefficient of uniformity is ratio of _____ and _____. **2**

(v) A inorganic silty soil of medium plasticity is represented as
  (a) SM
  (b) MI
  (c) OI
  (d) MH

(vi) The sieve analysis is performed to determine the particle size distribution of particles in range of
  (a) 0.075 mm and above
  (b) 0.075 mm and below
  (c) 20 mm and above
  (d) below 0.002 mm

(vii) The liquid and plastic limit exists in
  (a) sandy soils
  (b) gravel soils
  (c) clay soils
  (d) boulders

(viii) The MDD obtained by modified proctor test is always _____ than MDD obtained by standard proctor test.

(ix) The kneading action to soil is given by
  (a) sheep foot roller
  (b) pneumatic type roller
  (c) rammer
  (d) none of above

(b) Define following : (any **four**) **4**
  (i) water content
  (ii) submerged unit weight
  (iii) dry unit weight
  (iv) saturated unit weight
  (v) true specific gravity
  (vi) relative density.

(c) A soil mass in natural state has water content of 17.5% and void ratio of 0.87, find degree of saturation bulk unit weight and dry unit weight. Take specific gravity as 2.65. **6**

OR

(c) Explain step by step determination of dry density of soil by sand replacement method. **6**

2 (a) What is plasticity chart ? Give equation of A line and draw and discuss classification of fine grained soil. **6**

(b) Discuss various corrections applied in hydrometer analysis briefly. **6**

OR

(b) A soil has consistency index of 0.7, plastic limit of 35%, natural water content = 45%. Find liquid limit and plasticity index. **6**

3 (a) Differentiate between light and heavy compaction test. **6**

(b) Discuss effect of compaction on various soil properties. **6**

OR

(b) Describe heavy compaction test to determine O.M.C. and M.D.D. for soil in laboratory. **6**

(c) A laboratory compaction test of soil having specific gravity = 2.68 gave M.D.D. of 17.5 kN/m^3 and O.M.C. of 17%. (i) Determine degree of saturation. (ii) What would be the theoretical maximum dry density corresponding to (a) zero air voids and (b) 20% air voids at OMC. **6**

4 (a) Attempt all the questions :

(i) Equipotential lines cross flow lines at _____ angle. **1**

(ii) What is shear strength of soil ? **2**

(iii) The coefficient of consolidation varies with the change in _____. **1**

(iv) Define exit gradient. **2**

(v) The Mohr's circle has centre coordinates _____ and radius _____. **2**

(vi) Define coefficient of permeability. **2**

(b) Explain following : **6**

(i) Seepage velocity and discharge velocity

(ii) Quick condition

(iii) Define flow net and aquifer.

OR

(b) Explain laboratory falling head permeability test with sketch. **6**

(c) A sample of coarse sand is 20 cm long and 8 cm diameter. On testing the specimen in constant head permeameter water permitted under hydraulic head of 80 cm for 30 seconds was 1000 cc., Find coefficient of permeability. **6**

5 (a) State the assumptions of Tarzaghi's theory of one dimensional consolidation. **4**

(b) Define 'pre-consolidation pressure'. Explain the procedure to determine pre-consolidation pressure. **6**

OR

(b) Explain the method to determine coefficient of consolidation by square root time fitting method. **6**

(c) A 3 cm thick sample was tested in consolidometer with drainage at both sides. 40% of consolidation is achieved under load in 18 minutes. For the same consolidation of stress but only with single drainage estimate the amount of time in days for 6 meter thick layer of same soil in field to attain same degree of consolidation. **6**

6 (a) Describe triaxial test with neat sketch. **6**

OR

(a) Explain unconfined compression test in detail. **6**

(b) A cylindrical specimen of saturated clay 4 cm diameter and 8 cm high failed in unconfined compression under 800 kN load. Change in length at failure is 2 cm. Determine unconfined compressive strength and cohesion. **6**
