



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech/CE/SEM-8/CE-802/1/2013**

**2013**

**SOIL STABILIZATION AND  
GROUND IMPROVEMENT TECHNIQUE**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :  $10 \times 1 = 10$

- i) Pre-compression is a technique for in situ densification of
  - a) Sandy soil                      b) Silty soil
  - c) Sandy and silty soil        d) Clayey soil.
- ii) The diameter of sand wicks is in ranges from
  - a) 60 mm to 100 mm        b) 150 mm to 200 mm
  - c) 300 mm to 500 mm        d) 1 m to 1.5 m.
- iii) Suspension grouting is applicable only to
  - a) Fine silts                      b) Sands and Gravels
  - c) Colloidal clays              d) Clays.



- iv) For the economic use of vibratory rollers the minimum number of passes normally required is
  - a) 4 to 6 passes
  - b) 2 to 3 passes
  - c) 8 to 10 passes
  - d) 10 to 12 passes.
- v) In vertical drain the permeability of the clay layer is greatly reduced due to the reorientation of the soil particles. The phenomenon is known as the
  - a) Blocking
  - b) Clogging
  - c) Smear
  - d) None of these.
- vi) The column spacing of the stone columns may range from
  - a) 1 to 2 times the diameter of the columns
  - b) 3 to 4 times the diameter of the columns
  - c) 4 to 5 times the diameter of the columns
  - d) 2 to 3 times the diameter of the columns.
- vii) Soil nails are installed to the horizontal near the ground surface at the inclination of
  - a) 10 to 15
  - b) 12 to 15
  - c) 20 to 25
  - d) none of these.
- viii) For successful grouting of soils groutability ratio =  $(D_{15} \text{ of soil}) / (D_{85} \text{ of grout})$  should be
  - a) less than 25
  - b) greater than 25
  - c) less than 15
  - d) in between 10 to 15.
- ix) The types of reinforcements normally used are
  - a) Geotextiles
  - b) Metal strips
  - c) Geogrids
  - d) All of these.
- x) The design of geotextiles reinforced walls is similar in principle to that of
  - a) Counterfort retaining walls
  - b) Cantilever walls
  - c) Reinforced earth walls
  - d) Gravity walls.



- xi) In woven geotextiles a set of yarns run perpendicular to the length of fabric called
- warp
  - weft
  - none of these.
- xii) Cement grout is a/an
- solution
  - emulsion
  - suspension
  - none of these.

**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

- Explain briefly different uses of geotextiles.
- Why is dewatering needed ? Describe briefly a method of dewatering.
- Discuss about stabilization of compressible soil layer by preloading.
- Briefly explain soil nailing and underpinning.
- Explain suspension and solution grout.

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

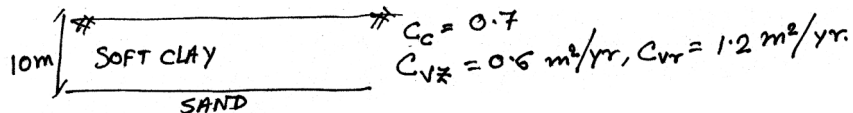
- Write short notes on any *three* of the following :
  - Compaction grouting
  - Vibrofloatation
  - Sand drains and sand wicks
  - Design of reinforced earth wall.



8. For a retaining wall of 8 m height with the backfill reinforced with metal strips the available data are :

Width of metal strip,  $b = 90$  mm and thickness of strip,  $t = 5$  mm; horizontal and vertical spacings are same and of 1 m. Soil properties are  $\phi = 38^\circ$ ,  $\gamma = 17$  kN/m<sup>3</sup>,  $\phi_c = 26^\circ$  ( assume yield stress  $f_y = 250$  MPa;  $F_s$  for steel = 1.67;  $F_s$  on soil friction = 1.5. Determine

- lengths  $L$  and  $L_e$  at varying depths,
  - the largest tension  $T$  in the strip and
  - the allowable tension in the strip.
9. From the given figure



compute :

- the time for 90% consolidation of the soft clays without sand wicks
  - the time for 90% consolidation with sand wicks
- Given that the spacing of sand wicks is 1 m on triangular grid and diameter of sand wicks is 100 mm
- Discuss the relative advantages and disadvantages of lime stabilisation for different types of soil.
    - Discuss the failure mechanism of stone column. 8 + 7
  - Explain the principle of ground improvement by stone column with the help of a neat sketch.
  - Explain how compactor is controlled in the field.