

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech(CE)/SEM-8/CE-802/1/2012**

**2012**

**SOIL STABILISATION & 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 × 1 = 10

i) In Sand drains type of loading is

- |                 |                   |
|-----------------|-------------------|
| a) radial       | b) preloading     |
| c) post loading | d) none of these. |

ii) In case of stablization usual proportion of cement to be added to a sandy soil is around

- |        |         |
|--------|---------|
| a) 5%  | b) 10%  |
| c) 15% | d) 20%. |



iii) Minimum strength for British method in soil cement mix design is

- a) 1.50 MPa                      b) 1.65 MPa
- c) 1.72 MPa                      d) 2 MPa.

iv) The aim of soil stabilization is to increase the

- a) seepage                      b) bearing capacity
- c) shear strength              d) both (b) and (c).

v) Pre-compression is a technique for *in situ* densification of

- a) sandy soil                      b) silty soil
- c) sandy and silty soils      d) clayey soils.

vi) Sand drains are provided

- a) to accelerate the consolidation process
- b) to increase the rate of gain of shear strength
- c) in saturated clays
- d) for all of these.



vii) Generally grout can be used if  $k$  of the deposit

- a)  $< 10^{-3}$  m/s                      b)  $> 10^{-3}$  m/s  
c)  $< 10^{-5}$  m/s                      d)  $> 10^{-5}$  m/s.

viii) If  $U_v$  and  $U_r$  are respectively 67 and 77 per cent,  $U_{vr}$  is equal to

- a) 7.6%                                      b) 51.6%  
c) 92.4%                                      d) none of these.

ix) To prevent the soil mass getting displaced or fractured, the grouting pressure as a rule of thumb is limited to

- a) 25% of the effective overburden pressure at the depth  
b) 35% of the effective overburden pressure at the depth  
c) 45% of the effective overburden pressure at the depth  
d) 55% of the effective overburden pressure at the depth.

CS/B.Tech(CE)/SEM-8/CE-802/1/2012



- x) Rock & cable anchor is used in
  - a) lowering the water table
  - b) slope stabilization
  - c) pavement
  - d) sandy soil stabilization.
  
- xi) Well point systems are installed in
  - a) compaction
  - b) consolidation
  - c) drainage & dewatering
  - d) preloading process.
  
- xii) The aim of soil stabilization is to increase the
  - a) seepage
  - b) bearing capacity
  - c) shear strength
  - d) both (b) & (c).



**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. Discuss briefly about the different components of Reinforced soil.
3. What are the major functions of Geotextiles ? Differentiate between woven and non-woven geotextiles.
4. Discuss the parameters on which groutability of a soil mass depends.
5. How would you estimate the output of vibratory roller ? Discuss briefly about the Vibrofloatation method.
6. Explain how a surcharge load in excess of the final load of the structure helps in precompression.

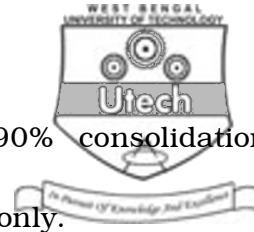
**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

3 × 15 = 45

7. During the construction of a highway bridge it is expected that the average permanent load on the clay layer will increase by about  $115 \text{ kN/m}^2$ . The average effective overburden pressure at the middle of the clay layer is  $210 \text{ kN/m}^2$ . Given  $H = 6 \text{ m}$ ,  $C_c = 0.25$ ,  $e_o = 0.9$  and  $C_v = 0.36 \text{ m}^2/\text{month}$  and taking the clay layer as normally consolidated.
  - a) Determine the total primary consolidation settlement of the bridge without pre-compression.



- b) Determine the time required for 90% consolidation under the additional permanent load only.
- c) Determine the surcharge that will be required to eliminate by pre-compression the entire primary consolidation settlement in 9 months.
8. What quantity of cement is required for premeation grouting in gravel, having void ratio of 0.6, if the grout mix has a water cement ratio of 6 : 1 ? Assume 50% of the void space get filled with grout slurry.
9. In a zoned embankment non-woven geotextiles are provided to act as a filter between the shell and the core. The seepage estimated using flow nets is  $13.5 \times 10^{-7} \text{ m}^2 / \text{sec-m}$ . The geotextile is a 12 mm thick 2500 gsm geosynthetic with an allowable permittivity of  $0.06 \text{ sec}^{-1}$  and  $O_{95}$  of 0.05 mm. The soil of the core is clayey silt with  $D_{85}$  of 0.04 mm and  $k$  of  $7.2 \times 10^{-8} \text{ m/sec}$ . Comments about the suitability of geosynthetic to be used as a filter.



10. a) Draw the flow diagram of reactions in lime-clay-water for lime stabilization.
- b) Describe the mechanism of lime soil stabilization.
11. Compare the use the sheep's foot and vibratory rollers in the surface compaction of granular.

