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 laoding 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.

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 brielfy 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 kN/m^2. The average effective overburden pressure at the middle of the clay layer is 210 kN/m^2. Given H = 6 m. C_c = 0.25, e_o = 0.9 and C_v = 0.36 m^2 /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 $13{\cdot}5 \times 10^{-7}$ m^2/sec-m. The geotextile is a 12 mm thick 2500 gsm geosynthetic with an allowable permittivity of 0·06 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 $7{\cdot}2 \times 10^{-8}$ 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.