



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.Tech(GEOT.ENGG)/SEM-2/GTE-204A/2012**

**2012**

**GROUND IMPROVEMENT TECHNIQUES**

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.*

Answer any *five* questions.

5 × 14 = 70

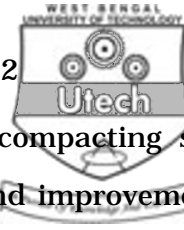
1. a) What are the fundamental principles of ground improvement in cohesive soil ? Indicate, with suitable sketches, two methods of ground improvement in cohesive soil.

b) What are Smooth-wheel rollers and for what soil are they suited ? If a roller is designated as 7.3 – 12.8 t what does it mean ?

8 + 6

30412 ( M.Tech )

[ Turn over



2. a) Discuss the vibroflotation method for compacting soil indicating its suitability, effectiveness and improvement achieved.
- b) Discuss the principle of compaction by explosives. What are the precautions taken while adopting blasting for densification ? 7 + 7
3. a) What are sand drains ? How are they installed ? How is the average degree of consolidation estimated for use of sand drains ?
- b) Discuss the failure mechanism of stone column. How is the load bearing capacity of stone column determined ? 7 + 7
4. a) On an embankment dam compacting rollers are used to compact the clay layer. Determine the quantity of material compacted by a sheep's foot roller if it travels at 4.0 km/hr, time of rolling is 40 min, length of drum is 2.8 m, number of drums is one, fraction of overlap is  $\frac{1}{8}$ , layer thickness is 0.4 m and the number of passes given are 6.
- b) What is meant by 'Soil stabilisation' ? Discuss the basic principle of soil stabilisation. Discuss the relative advantages and advantages of lime stablization for different types of soil. 5 + 9



5. A soil layer 6.0 m thick over strong, rigid and impermeable rock contains sand drain 0.25 m dia at 2.5 m spacing and has  $m_v = 0.72 \times 10^{-4} \text{ m}^2/\text{kN}$  and  $c_v = c_h = 2.8 \text{ m}^2/\text{year}$ . A uniform vertical stress  $q = 60 \text{ kN/m}^2$  is applied suddenly to the surface over a very wide area. Calculate the magnitude of the final consolidation settlement and the time taken for the settlement to reach 60% of this value

- a) without the drains in place,
- b) with the drains in place.

6. a) To construct a road on soil conforming to the following gradation specification :

Percentage passing 425  $\mu$  for sample A,

$$P_A = 12 \text{ and for sample B, } P_B = 78$$

Liquid limit for sample A,

$$L_A = 28\% \text{ and for sample B, } L_B = 34\%$$

Plasticity index for sample A,

$$I_A = 5\% \text{ and for sample B, } I_B = 13\%$$

The ratio of sample A and sample B = 1 : 1

- i) What will be the L.L. & P.I. of the mixture ?
  - ii) If the maximum L.L. & P.I. are to be respectively 39% & 10%, what should be the proportion of A & B in the mix ?
- b) Discuss briefly the precautionary measures and maintenance of dewatering method. Also highlight the undesirable side-effects of Dewatering method. 7 + 7



7. a) What are the different factors involved during planning of a Grounting Project ? Discuss briefly.
- b) Permeation Grouting will be carried out as ascending stage grouting, in stages of 2 m starting from 9 m depth and moving upwards to 7,5 and 3 m depth below the ground surface in dry sandy gravel. What is the maximum permissible grout pressure at 9 m depth ? By what amount should this grout pressure be reduced for each stage of ascent ? The sandy gravel has  $\gamma_b = 16 \text{ kN/m}^3$ ,  $\varphi' = 34^\circ$  and  $K_0 = 0.42$ . 6 + 8
8. Explain with neat sketch, the use of Geotextiles in the following civil engineering project/works :
- a) Railway tracks
- b) Earth bunds with steeper side slopes of  $1\frac{1}{2} \text{ H} : 1 \text{ V}$ .
- c) Reinforced earth retaining walls.  $4\frac{1}{2} + 4\frac{1}{2} + 5$

