

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 2714306**Date: 12-01-2015****Subject Name: Soil Improvement Technology****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Define soil improvement technology? Under which circumstances we should go for soil improvement? Enlist the various methods available as per IS Code. Discuss the various methods in parametric form to access the suitability of these methods. **14**

Q.2 (a) Explain the principle of soil stabilization for fine grain silty soils, clayey soils and granular soils **07**

(b) What do you mean by coarse grouts? Discuss the various criteria for penetrability of coarse grouts. **07**

OR

(b) Explain type of grouting on functional basis in detail with neat sketch. What do you mean by gel strength? How it is determined? **07**

Q.3 (a) Explain the principle of each method mentioned below and discuss (**any one**) in detail with neat sketches, formulas/equations and plots: **07**
i) Thermal stabilization ii) Prefabricated vertical drains iii) Stone columns

(b) A sample of soil compacted according to the standard proctor test has a density of 2.14 g/cm^3 at 100% compaction and at an OMC of 11%. What is the dry unit weight? What is the dry unit weight at zero-air voids? If the voids filled with water what will be the saturated unit weight? Assume $G = 2.64$. **07**

OR

Q.3 (a) Explain the fundamental mechanism of soil-cement. Explain in detail the various properties needed to be evaluated for cement-soil mixtures. Discuss Compressive strength, volume change properties and type of cement in detail with necessary plots. **07**

(b) Following are the details for the backfill material used in a Vibroflotation project: $D_{10} = 0.36\text{mm}$, $D_{20} = 0.52\text{mm}$, $D_{50} = 1.42\text{mm}$. Determine the suitability number, S_N . What would be its rating as a backfill? **07**

Q.4 (a) Distinguish chemical grouts. Enlist the various parameters to be verified in chemical grout design. How chemical grouts are more superior as compared to cement grouts? **07**

(b) Explain in detail bituminous stabilization. Under which soil conditions they are preferred? Classify the various bituminous stabilized mixtures with their applicability. **07**

OR

Q.4 (a) Define Newtonian and binghamian grouts. Explain the role of physical, rheological and strength measurements on grout selection. Support your answer with necessary plots and case study. **07**

- (b) Explain lime stabilization in detail and also discuss the role of various stabilizing agents in development of strength. 07

Q.5 Enlist the various physical and rheological properties needed for grout mix design. How they are determined? Explain the determination of each property in detail with neat sketch. 14

OR

Q.5 (a) Attempt any one: 07

(i) Discuss the concept of Deep mixing and justify the fundamental considerations by one case study.

(ii) A silicate grouting is to be done at a place where the permeability of the alluvium to be grouted is 1.1×10^{-3} cm/sec and the porosity of the alluvium is 30% at an injection pressure of 7kg/cm². The internal radius of the grout pipe is 2.5cm. The properties of the grouts: density of grout 1.14gm/cc, ratio of viscosity of grout to that of water 2.5 and gelling time of the grout 45min. Compute the radius of the grout front at the gel time of the grout in the formation.

(iii) What is Soil Nailing? Explain the principle and working of ground anchors.

(b) Discuss soil-cement mix design in detail for both major projects and minor projects. Support your answer with flowcharts. 07
