Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E.-Ist (Remedial New course) EXAMINATION – SUMMER 2015

Subject code: 2714306 **Date: 15/05/2015**

Subject Name: Soil Improvement Technology

Time: 10:30 AM to 1:00 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		What do you means by soil improvement technology? How it is classified as per soil type and methodology? Discuss the suitability of various methods as per IS code for depths greater than 10m.	**14**
Q.2	**(a)**	Define soil stabilization. What are the requirements of soil stabilization? Justify the mechanism of soil stabilization for granular soils, clayey soils and silty soils.	**07**
	(b)	Enlist classification of grout mix. What do you mean by fine grouts? Discuss the various criteriaõs for penetrability of fine grouts.	**07**
		OR	
	(b)	Discuss the characteristics of cement based grouts. Explain neat cement, cement with bentonite, cement with chemical admixtures based grouts in detail.	**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: i) Vibro Compaction ii) Compaction Piles iii) Sand Columns	**07**
	(b)	A sample of soil compacted according to the standard proctor test has a density of 2.18 g/cm^3 at 100% compaction and at an OMC of 13%?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 = 2.67.	**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} = 0.36mm, D_{20} = 0.52mm, D_{50} = 1.42mm. Determine the suitability number, S_N. What would be its rating as a backfill?	**07**
Q.4	**(a)**	What do you mean by lime stabilization? Discuss in detail the various selection criteriaõs for it. Support your answer with one case study.	**07**
	(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**
		OR	
Q.4	**(a)**	Discuss soil-cement mix design in detail for both major projects and minor projects. Support your answer with flowcharts.	**07**
	(b)	Explain in detail bituminous stabilization. Under which soil conditions they are preferred? Classify the various bituminous stabilized mixtures	**07**

with their applicability.

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 **<u>any one</u>**: **07**

(i) Write a detail note on Soil Nailing and Deep Mixing.

(ii) A silicate grouting is to be done at a place where the permeability of the alluvium to be grouted is 1.2×10^{-3} cm/sec and the porosity of the alluvium is 35% at an injection pressure of $6 kg/cm^2$. The internal radius of the grout pipe is 2.5cm. The properties of the grouts: density of grout 1.16gm/cc, ratio of viscosity of grout to that of water 2.5 and gelling time of the grout 50min. Compute the radius of the grout front at the gel time of the grout in the formation.

(iii) Distinguish between Newtonian and binghamian grouts. Explain only role of strength measurements on grout selection. Support your answer with necessary plots.

(b) Enlist various chemical grouts. Which are the parameters to be verified in chemical grout design and how? If necessary support your answer with one case study. **07**

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