Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2714306 **Date: 04/01/2016**

Subject Name: Soil Improvement Technology

Time:2:30 pm to 5:00 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		Enlist the various soil improvement methods and discuss the various considerations for establishing need for soil improvement. Discuss the suitability of various methods as per IS code for depths greater than 10m only for cohesive soils.	**14**
Q.2	**(a)**	Discuss in detail the concept, principle, methodology and applications of dynamic compaction with neat sketches and plots.	**07**
	(b)	A sample of soil compacted according to the standard proctor test has a density of 21.2 kN/m^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 = 2.67.	**07**
		OR	
	(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.3	**(a)**	Explain the principle of each method mentioned below and discuss (**any one**) in detail with neat sketches, formulas/equations and plots: i) Prefabricated vertical drains ii) Stone columns iii) Use of admixtures	**07**
	(b)	Define grouting and discuss the various methods of grouting on functional basis. Differentiate fine grouts and coarse grouts with respect to penetrability.	**07**
		OR	
Q.3	**(a)**	What do you mean by soil stabilization? What are the requirements of any soil stabilization? Justify the mechanism of soil stabilization for granular soils, clayey soils and silty soils.	**07**
	(b)	Discuss the characteristics of cement based grouts. Explain neat cement, cement with bentonite, cement with chemical admixtures based grouts in detail	**07**
Q.4	**(a)**	Explain the fundamental mechanism of soil-cement stabilization. What role overall soil-cement mixtures plays in increasing the strength of soil? Discuss various engineering properties evaluated in soil-cement mixtures in detail with necessary plots.	**07**
	(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**
		OR	
Q.4	**(a)**	Compute the flow rate ***q*** for an injection pressure equivalent to 100m of	**07**

water-head, if an injection hole has a diameter of 40mm and 0.5m length of hole is exposed at any one time, if its $\mathbf{k}_G = 10^{-5}$ m/sec corresponding to a clean fine sand.

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

Q.5 Enlist the various physical properties needed for grout mix design for both fine grouts and coarse grouts. How they are determined? Explain the determination of each property in detail with neat sketch and justify its importance in grout mix design. **14**

OR

Q.5 Attempt **<u>any two</u>**: **14**

(i) 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.

(ii) Discuss in detail frame work approach, conceptual frame work approach, equivalent weight approach of grout mix design.

(iii) Enlist various methods employed in stage grouting. Explain the down stage without and with packer with neat sketch.

(iv) Discuss in detail the complete gelation mechanism with reactions for cement grouts.

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