Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEM-IV Examination-Nov-2011

Subject code: X40603 **Date: 25/11/2011**
Subject Name: Soil Engineering
Time: 2.30 pm -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	**(a)**	Explain stress distribution in soils for concentrated loads by Boussinesq's equation	**07**
	(b)	What do you understand by "Pressure bulb"? Illustrate with sketches.	**07**
Q.2	**(a)**	A concentrated load of 40 kN acts on the surface of a soil. Determine the vertical stress increment at points directly beneath the load up to a depth of 10m and draw a plot at an interval of 1m. Also plot the variation of vertical stress increment due to load in horizontal planes at depth of 2m up to a horizontal distance of 3m on either side of centre at an interval of 1m.	**07**
	(b)	Explain the principle of the direct shear test. What are the advantages of this test?	**07**
		OR	
	(b)	Differentiate between unconsolidated undrained test and a drained test. Under what condition are these test results used for design purposes?	**07**
Q.3	**(a)**	Write short notes on Mohr's Circle	**07**
	(b)	Calculate the potential shear strength on a horizontal plane at a depth of 3m below the surface in formation of cohesionless soil (i) when the water table is at a depth of 3.5 m. The degree of saturation may be taken as 0.5 on the average. Void ratio =0.5, grain specific gravity =2.7; angle of internal friction =30°. (ii) What will be the modified value of shear strength if the water table reaches the ground surface?	**07**
		OR	
Q.3	**(a)**	Two identical specimens, 3cm in diameter and 6cm high, of partly saturated compacted soil are tested in a triaxial cell under untrained conditions. The first specimen failed at an additional axial load (i.e. deviator load) of 800N under a cell pressure of 120 kN/m^2. The second specimen failed at an additional axial load of 950N under a cell pressure of 250 kN/m^2. The increase in volume of the first specimen at second specimen at failure is 1.6ml and it shortens by 0.8 cm, at failure. The increase in volume of the second specimen at failure is 2.4ml and it shortens by 1.2 cm at failure. Determine the value if apparent cohesion and the angle of shearing resistance.	**07**
	(b)	Write short notes on Unconfined compression test	**07**
Q.4	**(a)**	What are the various factors that affect the compaction of soil in the field? How will you measure compaction in the field?	**07**

(b) A soil in the borrow pit is at a dry density of 17kN/m^3 with a moisture content of 10%. The soil is excavated from this pit and compacted in an embankment to a dry density of 18kN/m^3 with a moisture content of 15%. Compute the quantity of soil to be excavated from the borrow pit and the amount of water to be added for 100m^3 of compacted soil in the embankment. **07**

OR

Q.4 (a) Differentiate between the compaction and consolidation. **07**

Q.4 (b) The settlement analysis (based on the assumption of the clay layer draining from top and bottom surfaces) for proposed structure shows 2.5cm of settlement in four years and an ultimate settlement of 10cm. However, detailed sub-surface investigation reveals that there will be no drainage at the bottom. For this situation, determine the ultimate settlement and the time required for 2.5cm settlement. **07**

Q.5 (a) Differentiate critically between Rankine and Coulomb theories of earth pressure. **07**

(b) A retaining wall, 6m high, retains dry sand with an angle of friction of 30° and unit weight of 16.2kN/m^2. Determine the earth pressure at rest. If the water table rises to the top of the wall, determine the increase in the thrust on the wall. Assume the submerged unit weight of sand as 10kN/m^3. **07**

OR

Q.5 (a) A new canal is excavated to a depth of 4m below ground level through a soil having the following characteristic c=12kN/m^2; ϕ =20°; e=0.6 and G=2.6. The slope of banks is 1in 1. Calculate the factor of safety with respect to cohesion when the canal runs full. If it is suddenly and completely emptied, what will be the factor of safety? Take Taylor's Stability Number S_n for i = 45° as follows: **07**

ϕ	5°	10°	15°	20°
S_n	0.136	0.108	0.083	0.062

(b) A granular soil has γ_{sat}=19kN/m^3, ϕ=35°. A slope has to be made of this material. If a factor of safety of 1.3 is needed against slope failure, determine the safe angle of the slope (i) when the slope is dry or submerged without seepage, (ii) if seepage occurs at and parallel to the surface of the slope. (iii) If seepage occurs parallel to the slope with the water table at a depth of 1.5m, what is the factor of safety available on a slip plane parallel to the ground surface at a depth of 4 m? Assume β=28°. **07**

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