Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER– IV • EXAMINATION – SUMMER 2015

Subject Code: X40603 **Date:02/06/2015**

Subject Name: Soil Engineering

Time: 10.30am-01.00pm **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)** Describe direct shear test .What are its limitations ? **07**

(b) Briefly explain the factors affecting compaction. **07**

Q.2 **(a)** Which of the following statements are true : **07**

(i) The stability numbers can be used for the analysis of purely cohesionless soil slopes.

(ii) The factor of safety of an infinite slope of a cohesive soil depends upon the height H of the slope.

(iii) Cullman's method assumes that the failure surface is a plane.

(iv) The upstream slope of an earth dam is critical during sudden drawdown conditions.

(v) The total stress analysis can be used for the stability of slopes

(vi) Direct shear test is valid only for cohesive soil.

(vii) Un confined compression test is valid only for cohesive soil.

(b) The following results were obtained from undrained shear box test on soil. **07**

Normal load (N)	250	500	750
Failure load (N)	320	400	610

Determine strength parameter in terms of total stress. The cross-sectional area of shear box was 36 cm^2.

OR

(b) Define the term 'Consolidation'. Explain the same with the help of Terzaghi's Spring Analogy concept. **07**

Q.3 **(a)** An unconfined cylindrical specimen of clay fails under an axial stress of 250 kN/m^2.The failure plane was inclined at an angle of 55˚ to the horizontal. Determine the shear strength parameters of the soil. **07**

(b) In a direct shear test on a specimen of clean, dry sand, a normal stress of 200 kPa was applied and failure occurred at a stress of 140 kPa. Find its angle of shearing resistance. **07**

OR

Q.3 **(a)** Define the terms with its importance in civil engineering: **07**

(i) Coefficient of compressibility

(ii) Coefficient of volume compressibility

(iii) Coefficient of consolidation

(b) During consolidation test, the void ratio is found to reduce from 0.90 to 0.50 under the stress increment of 100 kPa to 200 kPa, compute (i) coefficient of compressibility (ii) coefficient of volume compressibility & (iii) compression index. **07**

Q.4 **(a)** Draw neat sketches to show : **07**

(i) Failure of a finite slope. (ii) Toe failure

(iii) Base failure.

(b) If the stability number for each slope 10 m high is 0.056. determine its factor of safety given $\phi = 20°$, $c = 30$ kN/m^2, $\gamma = 10$ kN/m^3. **07**

OR

Q.4 **(a)** What is coulomb's wedge theory? Compare Rankin's theory and coulomb's theory. **07**

(b) A retaining wall with a vertical smooth back is 8 m high. It supports a cohensionless soil [γ = 19 kN/m, ϕ = 30°]. The surface of soil is horizontal. Determine the thrust in the wall. **07**

Q.5 **(a)** What is pressure bulb? Explain its use. **07**

(b) Three footings are placed at locations forming an equilateral triangle of 6 m sides. Each of the footings carry vertical loads of 500 kN Estimate the vertical pressure by means of Boussinesq's equation at depth of 3 m at the following locations : **07**

(i) Vertically below the centre of footings.

(ii) Below the centre of the triangle.

OR

Q.5 **(a)** Explain the 'square-root time fitting method' for determination of coefficient of consolidation. **07**

(b) The following data are obtained in a Compaction test: **07**

γ_b (kN/m^3)	20.2	20.8	21.7	22.0	22.1	22.0
Moisture content(%)	2 4.	2 .5	5.6	6	7.5	10.0

Determine OMC & MDD. Draw zero-air void line. Take G=2.65.

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