

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-IV • EXAMINATION – SUMMER • 2014****Subject Code: X40603****Date: 21-06-2014****Subject Name: Soil Engineering****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

1. *Attempt all questions.*
2. *Make suitable assumptions wherever necessary.*
3. *Figures to the right indicate full marks.*
4. *Use of Programmable calculator is strictly prohibited*
5. *Draw neat sketch wherever necessary*

- Q.1** Choose the correct answer from the following: **14**
- An isobar is a curve which _____
- (i) (a) joins point of equal horizontal stress
(b) joins point of equal vertical stress
(c) joins point of zero vertical stress
(d) joins point of maximum vertical stress
- (ii) A concentrated load of 1000 kN acts vertically at a point on the soil surface. According to Boussinesq's equation the ratio of the vertical stresses at depth of 3m and 5m is _____
(a) 0.35 (b) 0.70 (c) 1.75 (d) 2.78
- (iii) With an increase in liquid limit, compression index _____
(a) decreases (b) increases
(c) remain constant (d) may increase or decrease
- The coefficient of compressibility is the ratio of _____
- (iv) (a) Change in void ratio to change in effective stress
(b) Volumetric strain to change in effective stress
(c) Change in thickness to change in effective stress
(d) Stress to strain
- (v) The line of optimum generally corresponds to percentage air voids of about _____
(a) zero percent (b) 5 percent (c) 10 percent (d) 20 percent
- For a standard compaction test the mass of hammer and drop of hammer are as follows:
- (vi) (a) 2.6 kg and 450mm (b) 2.6 kg and 310mm
(c) 4.8 kg and 310mm (d) 4.89 kg and 450mm
- Taylor's stability charts are based on the total stresses using the _____
- (vii) (a) friction circle method (b) method of slices
(c) $\phi_u = 0$ analysis (d) none of these
- Q.2** (a) Explain Direct Shear Test. **07**
- (b) Two identical specimen of a soil were tested in a triaxial apparatus. First **07**
specimen failed at a total stress of 770 kN/m² when the cell pressure was 200 kN/m², while the second specimen failed at a total stress of 1370 kN/m² under a cell pressure of 400 kN/m². Determine the value of c and Φ for the soil. If the same soil is tested in a direct shear apparatus estimate the shear stress at which the sample will fail under a normal stress of 600 kN/m²

OR

- (b) A standard specimen of cohesionless sand was tested in triaxial compression and the sample failed at deviator stress of 460 kN/m^2 , when the cell pressure was 150 kN/m^2 , under drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principle stress at failure for another identical specimen of sand if it is tested under a cell pressure of 200 kN/m^2 ? **07**

- Q.3** A rectangular raft of size $30 \times 12 \text{ m}$ founded at a depth of 2.5 m below the ground surface is subjected to a uniform pressure of 150 kPa . Assume the centre of the area is the origin of coordinates $(0,0)$, and the corners have coordinates $(6,15)$. Calculate stresses at a depth of 20 m below the foundation level by the method of (a) Boussinesq, and (b) Westergaard at coordinates of $(0,0), (0,15), (6,0), (6,15)$ and $(10,25)$. Also determine the ratios of the stresses as obtained by the two methods. Neglect the effect of foundation depth on the stresses. **14**

OR

- Q.3** (a) Derive the Boussinesq equation for vertical stress for a uniform load on a strip area. **07**
 (b) A concentrated load of 40 kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 9 m (i) directly under the load and (ii) at horizontal distance of 6 m . **07**

- Q.4** (a) Compare the Coulomb's theory with Rankine theory for lateral earth pressure **07**
 (b) Plot the compaction curve and obtain the maximum dry unit weight and optimum moisture content. The following data refers to a compaction test as per Indian Standard. Take specific gravity of soil is 2.7 . **07**

Water Content (%)	8.5	12.2	13.75	15.5	18.2	20.2
Weight of wet sample (N)	18	19.4	20	20.5	20.3	19.8

OR

- Q.4** (a) A retaining wall, 7.5 m high, retains a cohesionless backfill. The top 3 m of the fill has unit weight of 18.2 kN/m^3 and $\phi = 30^\circ$ and the rest has unit weight of 24 kN/m^3 and $\phi = 24^\circ$. Determine the pressure distribution on the wall. **07**
 (b) How many days would be required by a clay stratum 5.5 m thick, draining at both ends with an average value of coefficient of consolidation $= 54 \times 10^{-4} \text{ cm}^2/\text{sec}$, to attain 50% of its ultimate settlement. **07**

- Q.5** (a) Write a short note on stability analysis of Infinite slopes for $c-\phi$ soils. **07**
 (b) Enlist the method for determination of coefficient of consolidation and explain any one in detail. **07**

OR

- Q.5** (a) Explain Swedish circle method to get factor of safety. **07**
 (b) Discuss about earth pressure at rest. What is active and passive earth pressure? **07**
