

17.4.14 (FN)

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B.E / B.Tech (Part Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

CIVIL ENGINEERING BRANCH

THIRD SEMESTER

PTCE 284/ PTCE 240/ PTCE 9255 – Soil Mechanics

(Regulation 2002/2005/2009)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Define void ratio and porosity.
2. What are the factors affecting compaction behaviour of soils.
3. What are different forms of soil water?
4. State Darcy's law along with its limitations.
5. What is the basis behind Newmarks influence chart?
6. What are different components of settlement?
7. What are the advantages and disadvantages of triaxial test?
8. Write expressions for Skempton's pore pressure parameters.
9. What are different modes of failures of slopes?
10. Differentiate finite slope from infinite slope.

Part – B (5 x 16 = 80 marks)

11. i) A sample of saturated soil has a water content of 35%. The specific gravity of soil solids is 2.65. Determine its void ratio, dry unit weight and saturated unit weight. (6)
ii) Explain IS soil classification system for classifying fine grained soil. (5)
iii) Discuss briefly various field compaction methods. (5)
12. a(i) An unconfined aquifer is known to be 32m thick below the water table. A constant discharge of 2 cubic meters per minute is pumped out of the aquifer through a tube well till the water level in the tube well becomes steady. Two observation wells at distances of 15m and 70m from the tube well show falls of 3m and 0.7m respectively from their static water levels. Find the permeability of the aquifer. (8)
a(ii) Discuss various factors affecting coefficient of permeability. (8)

OR

- b(i) What is flow net? List the properties of flow net. Explain in detail various uses of flow net. (8)
 - b(ii) The falling head permeability test was conducted on a soil sample of 4cm diameter and 18cm length. The head fell from 1.0m to 0.40m in 20 minutes. If the cross-sectional area of the stand pipe was 1cm^2 , determine the coefficient of permeability. (8)
13. a(i) A sand deposit is 10m thick and overlies a bed of soft clay. The ground water table is 3m below the ground surface. The unit weights of sand above and below the water table are

17kN/m³ and 19kN/m³ respectively. Find the total stress, pore water pressure and effective stress at the top, at the level of ground water table and at the bottom of the sand layer. (8)

- a(ii) Explain with neat sketch "log t" method for the determination of coefficient of consolidation. (8)

OR

- b(i) An undisturbed sample of a clay stratum 4m thick was tested in the laboratory and the average value of the coefficient of consolidation was found to be $2 \times 10^{-4} \text{ cm}^2/\text{sec}$. If a structure is built on the clay stratum, how long will it take to attain half the ultimate settlement under the load of the structure? Assume double drainage. (8)

- b(ii) A concentrated load 10kN acts on the surface of a soil mass. Using Boussinesq analysis find the vertical stress at points (i) 3m below the surface on the axis of loading and (ii) at radial distance of 2m from axis of loading but at same depth of 3m. (8)

14. a(i) Following are the results of a direct shear test on a soil.

Normal stress, kPa	25	75	150	250
Shear stress at failure, kPa	60	80	105	145

Determine the shear strength parameters. (8)

- a(ii) Draw the stress-strain and volume change-shear displacement characteristics of loose and dense sand. (8)

OR

- b(i) In a consolidated undrained test, the following results were obtained. Find the shear strength parameters of the soil. (10)

Cell pressure, kPa	100	200	400
Deviator stress at failure, kPa	310	490	840

- b(ii) A vane, 10.8cm long, 7.2cm in diameter, was pressed into a soft clay at the bottom of a bore hole. Torque was applied and the value at failure was 45Nm. Find the shear strength of the clay on a horizontal plane. (6)

15. a(i) An embankment 10m high is inclined at an angle of 40° to the horizontal. A slip circle method analysis gives the following forces per running meter: Total shearing forces = 450kN; Total Normal forces = 875kN; Total neutral forces = 220kN. The length of the failure arc is 22m. Soil tests in the laboratory indicate that effective angle of internal friction is 15° and effective cohesion is 20kPa. Find the factor of safety with respect to (i) Shear strength (ii) Cohesion. (10)

- a(ii) Discuss the slope protection measures that can be adopted to improve the stability of slopes. (6)

OR

- b(i) A slope of sandy soil extending to great extent is inclined at 20° to the horizontal. Determine the safety factor when a) the slope is dry and b) seepage occurs parallel to slope. The angle of shearing resistance of sand is 30° and the saturated unit weight of soil is 20kN/m³. (8)

- b(ii) What is a stability number? What is its utility in the analysis of stability of slopes? Discuss the uses of stability charts. (8)
