Question Paper Code : **31200**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Fourth Semester

Civil Engineering

CE 2251/CE 42/CE 1251/080100018/10111 CE 402 — SOIL MECHANICS

(Regulation 2008/2010)

(Common to PTCE 2251 – Soil Mechanics for B.E. (Part-Time) Third Semester –
Civil Engineering – Regulation 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between void ratio and porosity.

2. The most accurate method for the determination of water content in the laboratory is —————.

3. What is the importance of effective stress?

4. What is quicksand?

5. Define coefficient of compressibility.

6. What is an influence diagram? What is its use in practice?

7. List out the demerits of Triaxial test.

8. Write whether the following statement is true or false.

    On the failure plane, the shear stress is maximum.

9. What are different factor of safety used in the stability of slope.

10. List out the types of slope failure with figure.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Sandy soil in a borrow pit has unit weight of solids as $25kN/m^3$, water content equal to 11% and bulk unit weight equal to $16kN/m^3$. How many cubic metre of compacted fill could be constructed of $3500m^3$ of sand excavated from the borrow pit, if the required value of porosity in the compacted fill is 30%. Also compute the change in degree of saturation. (8)

(ii) Discuss various methods available for field compaction. (8)

Or

(b) (i) A fire grained soil has liquid limit of 60% plastic limit of 26%; classify the soil as per IS classification system. (8)

(ii) In a compaction test on a soil, the mass of wet soil when compacted in the mould was 20N. The water content of the soil was 16%. If the volume of the mould was 0.945 litres, determine the dry density, void ratio, degree of saturation and % air voids. Take G = 2.68. (8)

12. (a) (i) In a falling head permeameter test, the initial head is 40cm. The head drops by 5cm in 10 minutes. Calculate the time required to run the test for the final head to be at 20 cm. If the sample is 6 cm height and $50cm^2$ in cross sectional area, calculate the coefficient of permeability, take area of stand pipe is $0.5cm^2$. (8)

(ii) In a site the ground water table is at existing ground level. During flooding the water level raises to 2m above the ground level. Discuss the effect of raise in the water level on effective stress. (8)

Or

(b) (i) What is a flow net? Describe the method used to construct the flow net. (10)

(ii) What is soil suction? How is it measured? What are the factors that affect soil suction? (6)

13. (a) A rectangular foundation $3.0m \times 1.5m$ carries a uniform load of $40kN/m^2$. Determine the vertical stress at 'P' which is 3m below the round surface(refer the figure1). Use equivalent point load method. (16)

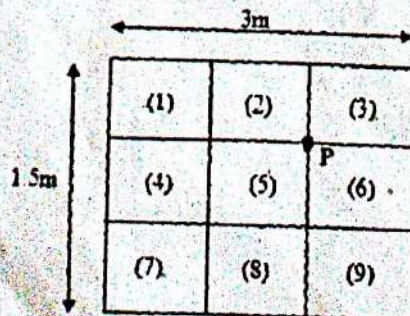Figure. 1

Or

(b) Discuss Terzaghi's theory of consolidation, stating the various assumptions and their validity. (16)

14. (a) The stress on a failure plane in a drained test on a cohesionless soil are as under:

Normal stress $(\sigma) = 100 kN/m^2$

Shear stress $(\tau) = 40 kN/m^2$.

(i) Determine the angle of shearing resistance and the angle which the failure plane makes with the major principal plane.

(ii) Find the major and minor principal stresses. (16)

Or

(b) What is the Mohr's strength theory for soil? Derive the expression relating major and minor principal stresses and shear strength parameters of soil. (16)

15. (a) (i) Describe modified Bishop's method for the stability analysis of slope. What are it limitations? (10)

(ii) Discuss various methods to protect the slopes. (6)

Or

(b) (i) A slope is to be constructed at an inclination of 30° with the horizontal. Determine the safe height of the slope at factor of safety of 1 .5.The soil has the following properties. (6)

$c = 15 kN/m^2$, $\varphi = 22.5°$, $\gamma = 20 kN/m^2$ (Sn = 0.046)

(ii) Discuss friction Circle method for stability analysis of slope. (10)

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