B. TECH DEGREE EXAMINATION, MAY 2012

MODEL QUESTION PAPER

FIFTH SEMESTER

CE 010504 GEOTECHNICAL ENGINEERING

Time: Three Hours **Maximum Mark: 100**

(Answer All Questions
Graph /Semi log Sheets to be supplied
Missing Data if any, may be suitably assumed)

PART A

(Answer All Questions)

1. Differentiate between Void ratio and porosity of soil. Give the relationship between them.

2. What is critical hydraulic gradient? Mention its significance.

3. What is Mohr's circle? What is its important characteristics?

4. What is Taylor's Stability number.

5. Define over consolidated, normally consolidated and under consolidated soil.

(5x3 = 15marks)

PART B

(Answer All Questions)

6. Sketch neatly the IS Plasticity Chart. Mention its use in soil classification.

7. Briefly explain the factors affecting permeability.

8. What is liquefaction of sand? How can it be prevented?

9. Explain one method of field compaction control.

10. Discuss the spring analogy for primary consolidation.

(5x5 = 25marks)

PART C (12 marks each)

Module I

11 (i) Obtain the relationship between void ratio, water content and specific Gravity for a partially saturated soil. **(6marks)**

(ii) A moist soil weighs 10.1 N and has a volume of 800 cc. Its dry weight is 9.18 N. Determine the void ratio, porosity, moisture content and degree of saturation. Take unit weight of water as 9.81kN/$m^3$and specific gravity G = 2.65 **(6marks)**

OR

12 (i)Explain the important three clay minerals. **(6marks)**

(ii) Calculate the flow index, plasticity index and toughness index of a soil sample from the following data obtained while conducting the liquid limit test. Plastic limit of the soil may be taken as 25%.

Number of blows	8	20	32	45
Water content(%)	70	60.2	53.4	50

(6marks)

Module II

13. At a construction site, a 3m. thick clay layer is followed by a 4m. thick gravel layer, which is resting on an impervious rock a load of 25 kN/m^2 is applied suddenly at the surface.The saturated unit weight of the soil are 19kN/m3 and 20kN/m3, for the clay and gravel layers respectively. The water table is at the ground surface. Draw diagrams showing variation with depth of total, neutral and effective stress in the layers. **(12marks)**

OR

14. (i)Explain the different properties of flow net **(6marks)**
(ii)A soil sample 90mm. high and 6,000 mm^2 in cross section was subjected to a falling head permeability test. The head fell from 500mm.to300mm.in1500sec.The soil has a permeability of 2.4 x 10^{-3}mm/sec. What is the diameter of the stand pipe. **(6marks)**

Module III

15. (i)Briefly discuss the Mohr Coloumb failure theory. Also, give the relationship between principal stresses at failure **(6marks)**
(ii)In a triaxial test conducted on a soil sample having cohesion of 12 kN/m^2 and angle of internal friction of 25°,the all- round fluid pressure was 200 kN/m^2.What should be the value of deviator stress at failure. **(6marks)**

OR

16 (i)A shear box test on clean sand gave a failure shear stress of 70kPa when the normal stress was 200 kPa.Draw the Mohr circle and Mohr envelope and find the principal stress at failure and the orientation of the principal planes.

(6marks)

(ii) How do you obtain shear strength of soft clays using Vane Shear Test. Derive the formula to be used. **(6marks)**

Module IV

17. (i)Explain standard compaction test. How is it different from heavy compaction test **(6marks)**

(ii)Explain the effect of compaction on the engineering properties of the soil .Explain briefly. **(6marks)**

OR

18 (i)A foundation trench with vertical slopes has to be excavated in a cohesive soil. The cohesive strength of the soil is 25kN/m^2.and the angle of shearing resistance is 10°.The unit weight of the soil is 19.4 kN/m^3. The magnitude of stability number is 0.22 for slope angle = 90° and the angle of shearing resistance =10°. What is the depth of foundation trench if the F.S is 1.5. **(6marks)**

(ii Explain briefly the Swedish Circle method, Ø=0 analysis. **(6marks)**

Module V

19. (i)Using Terzaghi's one dimensional theory of consolidation, derive the differential equation for consolidation. State the assumption used. **(6marks)**
(ii) A building is constructed over a 4 m. thick clay layer which is sandwiched between sand layers.Compute the time required for 50% consolidation of clay if its coefficient of consolidation is 0.02cm^2/min. **(6marks)**

OR

20. A saturated soil stratum 5m. thick lies above an impervious stratum and below pervious stratum. It has compression index of 0.25 and coefficient of permeability of $3.2x10^{-10}$m/s.Its void ratio at a stress of 147 kN/m2 is 1.9. Calculate (a) Change in void ratio due to increase of stress to 196kN/m2 (b)Coefficient of consolidation (c)coefficient of volume compressibility and (d) Time required for 50% consolidation (Tv=0.197) **(12marks)**