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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST - 2 EXAMINATION - April 2018

B. Tech. IV Semester

COURSE CODE: 10B11CE411 MAX. MARKS: 25

COURSE NAME: GEOTECHNICAL ENGINEERING

COURSE CREDITS: 04 MAX. TIME: 1Hr 30 Mins.

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume data wherever necessary. The course outcomes are given below with corresponding mapping indicated next to the question in bracket.*

CO1 *- To understand mechanics of soil and its importance in civil engineering*

CO2 *- To explain how three phase system is used in soil and how are soil properties estimated using three phase system*

CO3 *-To comprehend the role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated*

CO4 *- To impart the knowledge of compaction, estimating the magnitude and time-rate of settlement due to consolidation.*

CO5 *– To impart knowledge of determining shear parameters and stress changes in soil due to foundation loads, earth pressure theory and slope stability*

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[1] The values of liquid limit = 60%, plastic limit = 30% and shrinkage limit = 20% of a soil were reported. If a sample of this soil at liquid limit has a volume of 40 cc and its volume measured at shrinkage limit was 23.5 cc, determine: (a) Specific gravity of the solids (b) Shrinkage ratio **[3+2 = 5]** *[CO2; CO3]*

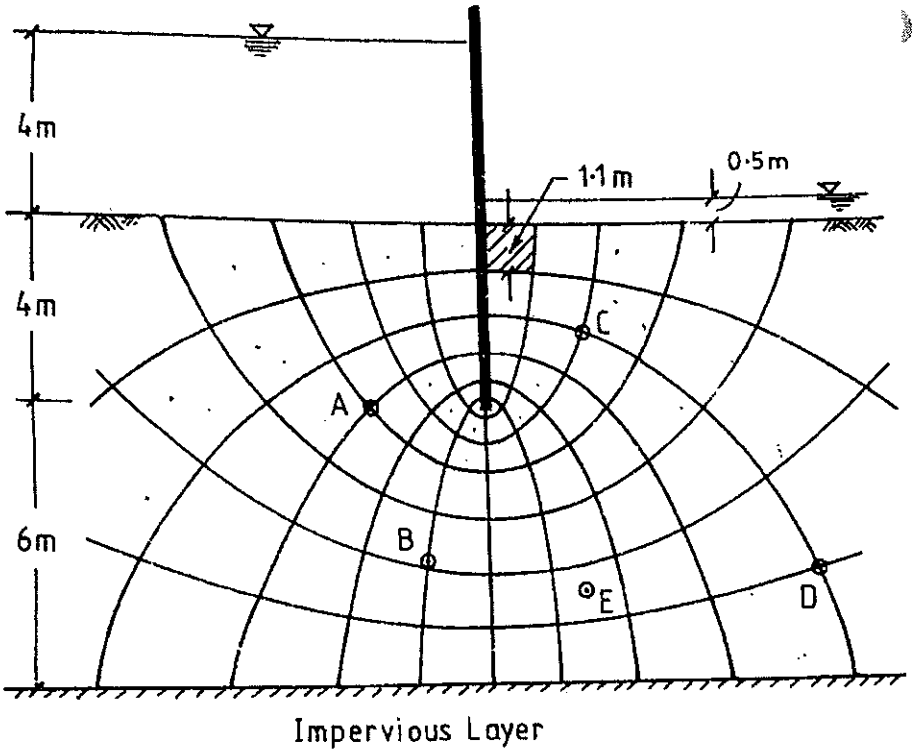
[2] Draw effective stress diagram for a sand stratum having a thickness of 10 m. The water table is at a depth of 2 m below the ground level and there is capillary rise of 1m above the water table. Assume the dry and saturated unit weights of the sand as 17 kN/m^3 and 21 kN/m^3, respectively. **[4]** *[CO2; CO3]*

[3] Explain the term 'Optimum moisture content'? How it is affected by compactive effort? **[3]** *[CO1; CO3; CO4]*

[4] Derive the ratio of average permeability in the horizontal direction to that in the vertical direction for a soil deposits consisting of three horizontal layers if the thickness and

permeability of the second layer is twice that of the first and those of the third layer is twice that of the second? **[5]** *[CO1; CO3]*

[5] A single row of sheet pile is driven upto a depth of 4m in a bed of clean sand having a co – efficient of permeability of 0.002 cm/sec. An impermeable layer of very stiff clay exists at a depth of 10 m below the G.L. The sheet pile wall has to retain water upto 4m above G.L. The height of water level on the downstream side is 0.5 m. Based on the flownet given below,



Determine:

(i) The piezometric heads at points A, B, C, D and E

(ii) Quantity of seepage **(in m^3/day)** considering unit width of sheet pile

(iii) The exit gradient

(iv) Factor of safety against piping given G = 2.67 and e = 0.95

[3+3+1+1 = 8] *[CO2; CO3]*