

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

## TEST-3 EXAMINATION- JUNE -2016

## B.Tech IV Semester

COURSE CODE: 10B11CE411

MAX. MARKS: 35

COURSE NAME: Geotechnical Engineering

COURSE CREDITS: 04

MAX. TIME: 2 HRS

*Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume necessary data wherever required as per IS code.*

1. A 10 m high embankment has side slope of 1V: 2 H. The soil has a unit weight of  $20 \text{ kN/m}^3$ , cohesion of  $30 \text{ kN/m}^2$  and angle of internal friction of  $5^\circ$ . Consider any slip circle passing through the toe. Use friction circle method to find the factor of safety with respect to cohesion. [5]
  
2. A 6m thick clay stratum is overlain by 8 m thick stratum of coarse sand and is underlain by an impermeable shale rock. A rectangular footing, supporting the columns of a building, is to be founded at a depth of 1.2 m below the ground level. The size of the footing is 8.5 m by 13.6 m and it is loaded uniformly with a stress intensity of  $9.2 \text{ t/m}^2$ . The water table is located at 2 m below the ground level. The unit weight of sand above and below the water table are  $1.90 \text{ t/m}^3$  and  $2.10 \text{ t/m}^3$ . The properties of the clay are as follows:  
 $e_0 = 0.72$ ;  $G = 2.71$ ;  $w_L = 42\%$ ; co-efficient of consolidation =  $2.2 \times 10^{-3} \text{ cm}^2/\text{sec}$ .  
Determine:
  - a) Probable settlement of the footing
  - b) The time required to undergo a settlement of 5 cm. [2 + 3 = 5]
  
3. Define 'critical depth' in context of stability analysis for an infinite slope. Derive the expression for critical depth, if there is seepage parallel to the slope. [2 + 3 = 5]
  
4. The shear strength parameters of a given soil are  $c = 0.26 \text{ kg/cm}^2$  and  $\phi = 21^\circ$ . Undrained triaxial tests are to be carried out on specimens of this soil. Determine:
  - a) Deviator stress at which failure will occur if the cell pressure be  $2.5 \text{ kg/cm}^2$ .
  - b) The cell pressure during the test, if the sample fails when the deviator stress reaches  $1.68 \text{ kg/cm}^2$ . [2 + 3 = 5]

5. The rock content in a fill is 80% by dry weight. The rock can be compacted to a minimum void ratio of 0.73. The maximum dry weight to which the soil fraction can be compacted is 1.63 gm/cc. What is the maximum dry density to which the fill can be compacted? Given  $G_{\text{rock}} = 2.56$ . [5]
6. It is required to excavate a long trench in a sand deposit upto a depth of 3.5 m below the ground level. The sides of the trench should be vertical and are to be supported by steel sheet piles driven upto 1.5 m below the bottom of the trench. The G.W.T is at 1 m below G.L. In order to have dry working area, water accumulated in the trench will be continuously pumped out. If the sand has a void ratio of 0.72 and the specific gravity of solids be 2.66, check whether a quick sand condition is likely to occur. If so, what remedial measures would you suggest? [3 + 2 = 5]
7. The void ratio of a clay sample A decreased from 0.572 to 0.505 under a change in pressure from 122 kN/m<sup>2</sup> to 180 kN/m<sup>2</sup>. The void ratio of another sample B decreased from 0.61 to 0.557 under the same increment of pressure. The thickness of sample A was 1.5 times that of B. Nevertheless the time taken for 50% consolidation was 3 times larger for sample B than A. What is the ratio of coefficient of permeability of sample A to that of B? [5]