

## B.Tech 6th Semester Exam., 2015

## SOIL AND ROCK MECHANICS

Time : 3 hours

Full Marks : 70

Instructions :

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- (i) All questions carry equal marks.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all, selecting any **TWO** questions each from Groups A and B.
- (iv) Question No. 1 is compulsory.

1. Write whether the following statements are True or False (any seven) :

- (a) The Mohr's circle for unconfined compression test passes through the origin.
- (b) Vane shear test can be conducted on all types of soils.

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(c) The factor of safety of an infinite slope of a cohesive soil depends upon the height  $H$  of the slope.

(d) Culmann's method assumes that the failure surface is a plane.

(e) The active pressure is the minimum pressure which develops along the failure surface when the wall moves away from the fill.

(f) Quicksand is a type of sand. akubihar.com

(g) Stability number is a dimensionless quantity.

(h) Taylor's stability number is a function of slope angle only.

(i) The capacity of a stone to withstand scratching or indenting action is defined as its hardness.

GROUP—A

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2. (a) List the factors which affect the shearing strength of cohesive soils.
- (b) Unconfined compressive strength test is conducted on a saturated clay specimen 40 mm in diameter and 90 mm in length

measured on its sides. The specimen has coned ends and its length between the apices of the cones is 80 mm. The specimen fails under an axial compressive load of 460 N with axial deformation of 10 mm. Calculate the unconfined compressive strength of clay.

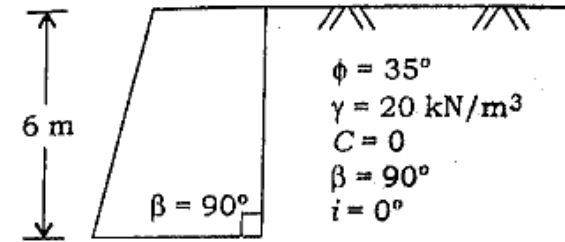
3. (a) Explain sensitivity and thixotropy in soils. How is soil classified based on sensitivity?  
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- (b) In a Vane shear test conducted in a soft clay deposit failure occurred at a torque of 42 Nm. Afterwards the vane was allowed to rotate rapidly and the test was repeated in the remoulded soil. The torque at failure in the remoulded soil was 17 Nm. Calculate the sensitivity of soil. In both the cases, the vane was pushed completely inside soil. The height of the vane and the diameter across blades are 100 mm and 80 mm respectively.

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4. (a) Define earth pressure at rest. Show the earth pressure distribution on a retaining wall, assuming that the soil is dry.

- (b) Determine the active earth pressure on the retaining wall shown in the figure given below using Culmann's method :



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5. (a) Discuss the friction circle method for the stability analysis of slopes. Can this method be used for purely cohesive soil?
- (b) A vertical cut is made in a clay deposit ( $C = 30 \text{ kN/m}^2$ ,  $\phi = 0$  and  $\gamma = 16 \text{ kN/m}^3$ ). Find the maximum height of the cut which can be temporarily supported.

GROUP—B

6. (a) Explain the compression test on rocks of irregular shapes. Support your answer with neat sketches.
- (b) Define slake durability index. Explain rock classification based on slake durability index.

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7. (a) Explain Deere and Miller (1966) rock classification based on strength and modulus ratio.
- (b) Describe Bieniawski's (1973) classification based on rock mass rating. Also critically comment on this classification system.

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8. (a) Correlate rock mass quality with RQD.
- (b) Explain different modes of failure of rock slopes.

9. Write short notes on any *three* of the following :

(a) Shotcreting

~~(b)~~ Rock anchors

~~(c)~~ RQD

(d) Rock-soil boundary

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