

B.Tech 6th Semester Examination, 2017

Soil and Rock Mechanics

Time : 3 hours

Full Marks : 70

Instructions :

- (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. akubihar.com
- (v) Things required Normal Graph Papers...

1. Answer any seven questions:

- (i) During triaxial test, the pore pressure parameter B is determined by measuring the change in
- (a) Minor Principal stress
- (b) Major principal stress
- (c) Deviator stress akubihar.com
- (d) None of these
- (ii) In a direct shear test, normal and shear stress at failure were 100 kN/m^2 and 40 kN/m^2 respectively. The angle of shearing resistance $\phi = 30^\circ$. The magnitude of major and minor principal stresses in kN/m^2 are

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(a) 179.3, 86.9.

(b) 169.3, 76.9.

(c) 159.3, 66.9.

(d) 149.3, 56.9.

(iii) The type of drainage test required to be conducted for the stability analysis of upstream slope of earth dam under rapid drawdown condition is

(a) UU test.

(b) CU test. akubihar.com

(c) CD test.

(d) All of these

(iv) A vertical cut is to be made in a saturated clay with $c=15 \text{ kN/m}^2$, $\phi = 0$ and $\gamma = 20 \text{ kN/m}^3$. What is the theoretical depth to which the clay can be excavated without side collapse?

(a) 6 m

(b) 2 m

(c) 2.5 m akubihar.com

(d) 3 m

(v) When the movement of a wall under earth pressures from the backfill was prevented, the coefficient of earth pressure was recorded as 0.5. The ratio of the coefficients of active and passive earth pressures of the backfill is

(a) 1/3

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(b) 3

(c) 1/9

(d) 9

(vi) For active state to develop, the backfill of the retaining wall should undergo

(a) Zero expansion

(b) Zero compression

(c) Maximum expansion

(d) Maximum compression

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(vii) The limitations of Swedish circle method is/are:

A. Overall moment equilibrium of sliding soil is not considered.

B. Equilibrium of individual slices of sliding soil mass is not considered.

C. Inter slice forces are not considered.

The correct answer is

(a) A and B only

(b) B and C only

(c) A and C only

(d) D only

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(viii) • Due to consideration of inter slice forces in Bishop's modified method of slices, the factor of safety relative to Swedish circle method

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(a) Increases

(b) Decreases

(c) May increase or decrease

(d) Cannot say

(ix) Stability of which of the following slopes of an earth dam will be critical during rapid drawdown

(a) Upstream slope

(b) Downstream slope

(c) Both upstream and downstream slope

(d) Either upstream or downstream slope

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(x) The seismic refraction method is based on the assumption that seismic velocity and density of soil

(a) Increase with depth

(b) Decrease with depth

(c) Uniform throughout all depths

(d) none of these

GROUP-A

2. (a) The shear strength parameters of a given soil are, $c = 0.26 \text{ kg/cm}^2$ and $\phi = 21^\circ$. Undrained triaxial test are to be carried out on specimens of this soil. Determine:

(i) deviator stress at which failure will occur if the cell pressure be 2.5 kg/cm^2 **akubihar.com**

(ii) the cell pressure during the test, if the sample fails when the deviator stress reaches 1.68 kg/cm^2 . 7

(b) In a direct shear test conducted on a cohesionless sand, the sample failed at a shear stress of 120 kPa when the normal stress was 200 kPa . Draw the Mohr's circle and strength envelop. Determine the angle of shearing resistance, locate the principal planes and find the principal stresses. **akubihar.com** 7

3. (a) Describe the conditions which will guide the choice of laboratory triaxial test to be carried out on a particular soil sample. 4

(b) A series of consolidated undrained (CU) triaxial tests were conducted on an over consolidated clay with pore pressure measurement and the following results were obtained.

Sample no	Cell pressure (kN/m^2)	Deviator stress (kN/m^2)	Pore water pressure (kN/m^2)
1	125	510	-70
2	250	620	-10
3	500	850	+120

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Plot the strength envelopes in terms of total stresses and effective stresses and hence determine the strength parameters for both the cases. **akubihar.com** 6

(c) In a triaxial test, a soil sample was consolidated under a cell pressure of 700 kN/m^2 and a back pressure of 350 kN/m^2 . Thereafter, with drainage not allowed, the cell pressure was raised to 800 kN/m^2 resulting in a increased pore water pressure reading of 445 kN/m^2 . The axial load was then increased to give a deviator stress of 575 kN/m^2 (while the cell pressure remained at 800 kN/m^2) and a pore water pressure reading of 640 kN/m^2 . Calculate the pore water pressure coefficients B and A. 4

4. Find out the depth of embedment D of sheet pile for the wall shown in Fig. 1. **akubihar.com** 14

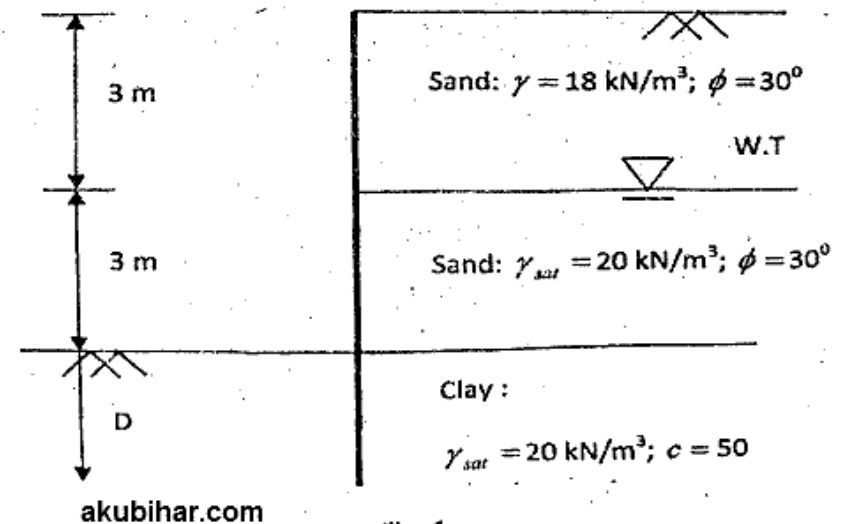


Fig. 1

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Cc

5. (a) A slope of 35° inclination and 6 m vertical height is to be made in a purely cohesive soil having a unit weight of 1.85 t/m^3 and a cohesion of 6 t/m^2 . Determine the factor of safety of the slope against sliding failure. 7
- (b) A cutting is to be made in a soil mass having $\gamma = 1.8 \text{ t/m}^3$, $c = 1.6 \text{ t/m}^2$ and $\phi = 15^\circ$. with side slopes of 30° to the horizontal, upto a depth of 12 m below the ground level. Determine the factor of safety of the slope against shear failure. Assume that friction and cohesion are mobilised to the same proportion of their ultimate values. Given: 7

ϕ	β	S_n
10°	30°	0.075
15°	30°	0.046

GROUP-B

6. Describe metamorphic rocks in detail. 14
7. Write about uniaxial unconfined compressive strength of rocks. 14
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8. Describe the following; 7+7
- (a) Direct shear strength test on rocks
- (b) Punch shear test on rocks.
9. Describe the sampling procedure of rocks. Also, write about the procedure of preparing samples of rocks for different types of testing. 14