

# KATIHAR ENGINEERING COLLEGE, KATIHAR

## DEPARTMENT OF CIVIL ENGINEERING

**Subject:** Soil & Rock Mechanics

**Maximum Marks:** 05

**Time:** 40 Minutes

**Instructor:** Rashid Mustafa

### Test- 02

**Q.1** Saturated stiff clay has unit weight  $2 \text{ gm/cm}^3$  and unconfined compressive strength  $2 \text{ kg/cm}^2$ . The depth of tension crack that would develop in the clay is ----- m

**Q.2** In a Mohr's diagram, a point above the Mohr's envelope indicates

- (a) Imaginary condition      (b) Safe condition      (c) Condition of maximum obliquity      (d) None

**Q.3** Unconfined compression test is most suitable for determining the

1. Sensitivity of clay
2. Settlement of embankments
3. Strength of partially saturated clay sample
4. Strength of fully saturated clay sample

Which of these statements are correct?

- (a) 1,2,3 and 4      (b) 2 and 3 only      (c) 3 and 4 only      (d) 1 and 4 only

**Q.4** Which one of the following is the appropriate triaxial test to assess the immediate stability of an unloading problem, such as an excavation of a clay slope?

- (a) UU test      (b) CU test      (c) CD test      (d) None

**Q.5** Given that for a soil backfill,  $K_A$ = coefficient of active pressure,  $K_P$ = coefficient of passive pressure and  $K_O$ = coefficient of earth pressure at rest, which one of the following represents the correct relationship between  $K_A$ ,  $K_O$  and  $K_P$ ?

- (a)  $K_O = K_P/2$       (b)  $K_O = (K_A + K_P)/2$       (c)  $K_O = (K_P - K_A)/2$       (d) None of the above

**Q.6** A vertical retaining wall retains a  $c-\phi$  backfill and carries a surcharge of uniform intensity  $q$ . The depth  $Z_0$  from the top of the wall where the active earth pressure is zero is given by ( $\alpha = 45^\circ + \phi/2$  and  $\gamma$ = unit weight of the soil)

- (a)  $\frac{q}{\gamma}$       (b)  $\frac{2c}{\gamma} \tan \alpha - \frac{q}{\gamma}$       (c)  $\frac{2c}{\gamma} \tan \alpha + \frac{q}{\gamma}$       (d)  $\frac{2c}{\gamma} \tan \alpha$

**Q.7** A slope is to be constructed at an angle of  $30^\circ$  to the horizontal from a soil having the properties  $C = 15 \text{ kN/m}^2$ ,  $\phi = 22.5^\circ$ . Taylor stability number is 0.046. If a factor of safety (with

respect to cohesion) of 1.5 is required, then the safe height of the slope will be -----  
m.

**Q.8** During the first stage of triaxial test when the cell pressure is increased from  $0.10 \text{ N/mm}^2$  to  $0.26 \text{ N/mm}^2$ , the pore pressure increases from  $0.07 \text{ N/mm}^2$  to  $0.15 \text{ N/mm}^2$ . The value of Skempton's pore pressure parameter B is -----

**Q.9** Using the Mohr's diagram, the relation between major principal stress  $\sigma_1$ , minor principal stress  $\sigma_3$  and shear parameters  $c$  and  $\phi$  is given by  $\sigma_1 = \sigma_3 N_\phi + 2c \sqrt{N_\phi}$ . What is the value of  $N_\phi$  in this equation?

(a)  $\frac{1 - \sin(\frac{\phi}{2})}{1 + \sin(\frac{\phi}{2})}$       (b)  $\frac{1 + \sin\phi}{1 - \sin\phi}$       (c)  $\frac{1 - \sin\phi}{1 + \sin\phi}$       (d)  $\frac{1 + \sin(\frac{\phi}{2})}{1 - \sin(\frac{\phi}{2})}$

**Q.10** Consider the following:

- |                               |                               |
|-------------------------------|-------------------------------|
| 1. Closing the drainage valve | 2. Opening the drainage valve |
| 3. Applying cell pressure     | 4. Shearing                   |

What is the correct sequence of operation for conducting CU triaxial test?

- (a) 1-2-3-4      (b) 3-2-1-4      (c) 2-1-3-4      (d) 2-3-1-4

**Q.11** The nature of earth pressure above dredge line behind a cantilever sheet pile wall is

- (a) Active      (b) Passive      (c) At rest      (d) Active and passive

**Q.12** An infinite slope is made up of  $c-\phi$  soil having cohesion is  $20 \text{ kPa}$  and dry unit weight  $16 \text{ kN/m}^3$ . The angle of inclination and critical height of the slope are  $50^\circ$  and  $7 \text{ m}$ , respectively. To maintain limiting equilibrium, the angle of internal friction of the soil (in degree) is -----

**Q.13** The effective stress friction angle of a saturated cohesionless soil is  $40^\circ$ . The ratio of shear stress to normal effective stress on the failure plane is -----

**Q.14** Using  $\phi=0$  analysis and assuming planar failure, the minimum factor of safety against shear failure of a vertical cut of height  $6 \text{ m}$  in a pure clay having  $c = 120 \text{ kN/m}^2$  and  $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$  is -----

**Q.15** An UCS test was conducted on undisturbed clay. The sample had a diameter of  $37.5 \text{ mm}$  and was  $80 \text{ mm}$  long. The load at failure measured by proving ring was  $28 \text{ N}$  and the axial deformation at failure was  $13 \text{ mm}$ . The undrained shear strength of the clay is -----  
 $\text{kN/m}^2$ .

< END OF THE QUESTION PAPER >