Civil Engineering Department

Subject- Geotechnical Engineering-II (CBCGS)

Q.NO	PRACTICE QUESTION
1	Terzaghi's one dimensional consolidation theory assumes that (a) e vs p relationship is linear (b) e vs $\log_{10}p$ relationship is linear (c) p vs $\log_{10}e$ relationship is linear (d) e vs $\log_{10}(p/p_o)$relationship is linear
2	The slope of the e-log p curve for a soil mass gives (a) coefficient of permeability, k (b) coefficient of consolidation, C_v (c) coefficient of volume compressibility, m_v (d) compression index, C_c
3	The immediate settlement can be computed from the expression, based on (a) Theory of plasticity (b) Theory of elasticity (c) Terzaghi's analysis (d) Pressure distribution
4	The immediate settlement (in cm) of a concrete isolated footing of size 1.5 x1.5 m founded at a depth of 1 m with pressure intensity of 200 kPa in silty soil with modulus of elasticity 9000 kPa and Poisson's ratio of 0.3 is [given: I_f= 1.12]: (a) 2.3 (b) 2.1 (c) 3.8 (d) 3.4
5	A 4 m thick layer of a fill material (γ_{bulk} = 20 kN/m^3) is to be laid instantaneously on the top surface of a 10 m thick clay layer. If the coefficient of volume compressibility (m_v) and γ_{sat} for the clay are: 3.2 x 10^{-4} m^2/kN and 18 kN/m^3 respectively, the consolidation settlement (in mm) of the clay layer due to placing of fill material is: (a) 256 (b) 320 (c) 276 (d) 226

6	A 4 m thick layer of normally consolidated clay has an average void ratio of 1.20. Its compression index is 0.5 and coefficient of consolidation is 1 m^2 /yr. If the increase in vertical pressure due to the foundation load on the clay layer is equal to the existing effective overburden pressure, the change in the thickness of the clay layer (in mm) is? (a) 273 (b) 183 (c) 172 (d) 266
7	The following data are given for the laboratory sample: $\sigma_o' = 350$ kPa; $e_o = 1.3$; $\sigma_o' + \Delta\sigma_o' = 500$ kPa; $e = 0.9$ If the thickness of the clay specimen is 40 mm, the value of coefficient of volume compressibility (in m^2 /kN) is: (a) 12.3×10^{-4} (b) 10.2×10^{-4} (c) 19.4×10^{-4} (d) 11.6×10^{-4}
8	In a direct shear test, a dry sand sample failed at a shear stress of 77 kPa when the normal stress on the sample was 125 kPa. The angle of internal friction of the sand sample is approximately (a) 20° (b) 28.1° (c) 31.6° (d) 37.4°
9	What will be the shearing resistance (in kN/m^2) of a sample of clay in an unconfined compression test falls under a load of 140 N? Take change of cross-sectional area A_f = 2288.7 mm^2 (a) 61.17 (b) 68.77 (c) 75.45 (d) 87.12
10	A saturated sample of c-ϕ soil failed at a deviator stress of 470 kN/m^2 in a drained triaxial test. The angle between the failure plane and horizontal was 65°. Take cohesion (c) of the sample is 20.0 kN/m^2. The values of principal stresses (in kN/m^2) are (a) 555.47 and 85.47 (b) 576.73 and 106.73 (c) 642.12 and 172.12 (d) 687.43 and 217.43
11	A CD test was carried out for a soil sample. The magnitude of applied cell pressure was 300 kN/m^2. Deviator pressure at failure was found to be 220 kN/m^2. Determine the angle between failure plane and major principal plane if drained cohesion (c') value is zero. (a) 52.78° (b) 55.79° (c) 61.22° (d) 65.32°

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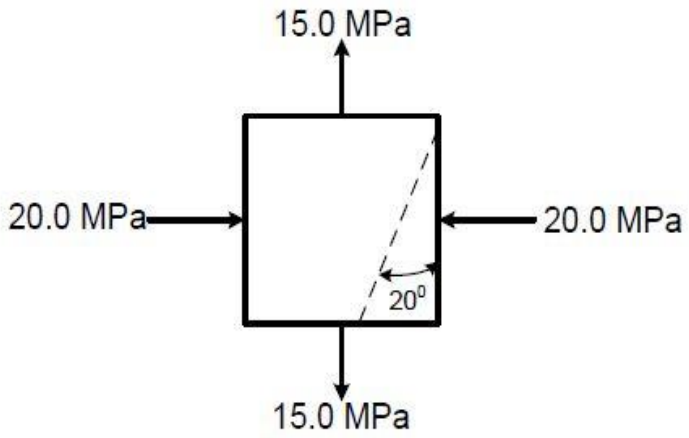
The grain of a wooden member forms an angle of 20° with the vertical. For the state of stress shown in the figure, determine the in-plane shearing stress parallel to the grain (τ_n) and the normal stress perpendicular to the grain (σ_n). Take tensile stress positive.



(a) $\tau_n = -11.25$ MPa and $\sigma_n = -15.91$ MPa

(b) $\tau_n = 11.25$ MPa and $\sigma_n = -15.91$ MPa

(c) $\tau_n = -11.25$ MPa and $\sigma_n = 15.91$ MPa

(d) $\tau_n = 11.25$ MPa and $\sigma_n = 15.91$ MPa

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If a soil has a cohesion of 5 kN/m^2 and an angle of internal friction of 25°. The normal stress acting on any plane within the soil is 17 kN/m^2. The shear strength of the soil (in kN/m^2) is

(a) 41.2 (b) 32.4 (c) 21.7 (d) 12.9

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The effective stress friction angle of a saturated, cohesionless soil is 35°. The ratio of normal effective stress to shear stress on the failure plane is

(a) 0.7 (b) 1.43 (c) 2.11 (d) 2.52

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A trial slip circle is shown in the figure. The total area of the wedge ABCDA is 156 m^2 and the average unit weight of the two layers is 18 kN/m^3. The radius of the slip circle is 21.6 m and the total weight of the wedge W is acting at a distance of 10.5 m from the vertical drawn through the centre of rotation as shown.

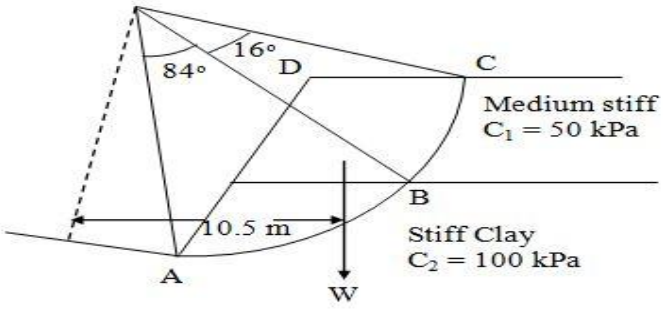
The factor of safety for the trial rotation failure is

(A) 1.56

(B) 1.96

(C) 2.33

(D) 2.53



16	A long natural slope in c-φ soil is inclined at 12° to the horizontal. The water table is at the surface and the seepage is parallel to the slope. If a plane slip has developed at a depth of 4m, the factor of safety is_____. (Take c = 8 kN.m^2, φ = 22° and γ_{sat} = 19 kN/m^3)
17	The stability of a finite slope can be investigated by which of the following method? a) Bishop's method b) Swedish circle method c) Friction circle method d) All of the mentioned
18	If the soil properties for all identical depths below the surface are constant, it is a _____ a) Finite slope b) Infinite slope c) Planar failure surface d) All of the mentioned
19	What will be the factor of safety with respect to cohesion of a clay slope laid at 1 in 2 to a height of 10 m, if the angle of internal friction φ=10° ; c=25 k N/m^2 and γ = 19 k N/m^3? a) 4.34 b) 2.06 c) 1.02 d) 20.6
20	The inclination of the failure plane behind a vertical wall in the active pressure case is inclined to the horizontal at (a) $45^0 - \phi/2$ (b) $45^0 - \phi$ (c) $45^0 + \phi/2$ (d) $45^0 + \phi$
21	The lateral earth pressure exerted by the soil when the retaining wall moves into the soil is (a) Earth pressure at rest (b) Active earth pressure (c) Total earth pressure (d) Passive earth pressure

22	A retaining wall of height 6m retains dry cohesionless soil. Void ratio and angle of internal friction of the back fill respectively are 0.7 and 30° in the loose state and they are 0.3 and 40° in the dense state. G_s =2.65. Passive earth pressures as per Rankine's theory in loose state (in kN/m length) is: Assume $\gamma_w = 10$ kN/m^3. (a) 1234.45 (b) 841.32 (c) 1246.67 (d) 2993.56
23	A retaining wall with a smooth vertical back retains sand backfill for a depth of 9 m (i.e., height of wall = 9 m). The backfill has a horizontal surface and has the following properties: $c' = 0$, $\phi' = 30°$, $\gamma = 18$ kN/m^3. The total active thrust (P_A) (in kN/m) on the retaining wall (as per Rankine's theory and neglecting the water table effect) is: (a) 96 (b) 243 (c) 226 (d) 336
24	With the increase in cohesion in soil (a) Decreases active pressure and increases passive resistance (b) Decreases both active pressure and passive resistance (c) Increases active pressure and decreases passive resistance (d) Increases both active pressure and passive resistance
25	Surcharge loading required to be placed on the horizontal backfill of a smooth vertical retaining wall so as to completely eliminate tensile crack is: (a) $2c$ (b) $2ck_a$ (c) $2c\sqrt{k_a}$ (d) $\frac{2c}{\sqrt{k_a}}$ Where c = cohesion of the backfill material; k_a = Coefficient of the active earth pressure of the backfill material