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|| आपकी सफलता, हमारी प्रतिबद्धता ||

1. Answer B

Solution

Due to erosion or wind effect the fine grained particle moves away from Hilly or mountaineer area gets deposited in plains in definite volume resulting cleanse, compressible and large coarse particle result large permeability.

Aeolian soil has low density and high compressibility

2. Answer A

Solution

$V_v = V_8$

$$\text{Void ratio } e = \frac{V_v}{V_s} = 1.0$$

$$n = \frac{e}{1+e} = 0.5 \text{ or } n = 50\%$$

3. Answer D

Solution

Given,

Void ratio $e_1 = 0.7$ and $e_2 = 1.2$

$V_2 = 30\ m^3$

$V \propto 1 + e$

$$\frac{V_1}{V_2} = \frac{1+e_1}{1+e_2}$$

$$V_1 = \left(\frac{1+0.7}{1+1.2}\right) \times 30$$

$$V_1 = \frac{1.7}{2.2} \times 30$$

$$V_1 = 23.2 m^3$$

4. Answer B

Solution

In AutoCAD, there are **5** drawing unit types available for measuring lengths:

Architectural: Displays units in feet and inches

Decimal: Displays units in continuous real numbers

Engineering: Displays units in feet and decimal inches

Fractional: Displays units in fractions

Scientific: Displays units in exponential notation

5. Answer C

Solution

Partially saturated soil will have both air and water present.

The partially saturated soil is classified as three phase system.

Air	V_a
Water	V_w
Solid	V_s

If fully saturated soil (no air content).

Water
Solids

If soil is perfectly dry (no water content)

Air
Solids

6. Answer A

Solution

$$\text{Sensitivity} = \frac{\text{undisturbed Soil}}{\text{Remoulded Soil}}$$

Insensitive $\rightarrow 1$

Normal Sensitive $\rightarrow 2 - 4$

Sensitive $\rightarrow 4 - 8$

Extra Sensitive $\rightarrow 8 - 16$

Quick $\rightarrow > 16$

7. Answer C

Solution

- The visual appearance of the soil is called texture. The texture depends upon particle size, shape of the particle and gradation of particles.
- Dilate (expand in volume) and dilatancy is a common feature of the soils and sands.
- Fine grain soil can be detected by dilatancy test, if dilatancy reaction is quick, it is said to be silt else clay.
- Human naked eye can see individual particles of coarse grain soil. hence coarse grained soil can be identified by visual observation.

8. Answer C

Solution

Computer programs are **software**, not hardware. Hardware refers to the physical components of a computer system that you can touch.

Graphic display terminals: Physical screens used to view CAD designs.

Computer: The physical CPU and machine processing the data.

Keyboard: An input hardware device used to type commands.

9. Answer B

Solution

		% cum. Retain wt.	% finer
600 μ	800 g	(800/2000)100 = 40%	60%
500 μ	1000 g	(1800/2000)100 = 90%	10%
425 μ	200 g	(2000/2000)100 = 100%	0%

Coefficient of uniformity = Cu $= \frac{D_{60}}{D_{10}}$

$= \frac{600}{500} = 1.2$

10. Answer A

Solution

$Ip = w_L - w_P = 0.49 - 0.17 = 0.32$

11. Answer B

Solution

CRT (Cathode Ray Tube) screens use the **RGB color model**. Three electron guns emit beams that hit red, green, and blue phosphor dots on the screen. Combining these three primary colors of light creates all other colors.

12. Answer D

Solution

The use of a particle size

(i) For calculating the coefficient of permeability

(ii) For calculating the compressibility as soil

(iii) For asset the susceptibility of soil to frost action

(iv) For assessing the mode of deposition of soil

13. Answer B

Solution

Order of size → Kaolinite > **Illite** > Montmorillonite.

14. Answer B

Solution

Given data, $W_L = 45\%$, $W_P = 20\%$

$(I_p)_{soil} = W_L - W_P$

$(I_p)_{soil} = 25\%$

$(I_p)_{A-Line} = 0.73\ (W_L - 20)$

$= 0.73\ (45 - 20)$

$= 18.25\%$

$(I_p)_{soil} > (I_p)_{A-Line}$ → Clay

$25\% < W_L < 50\%$ → Intermediate

Thus soil is classified as CI.

15. Answer A

Solution

GI value = 0.2a + 0.005 ac + 0.01 bd

a = p - 35 ≯ 40

b = p - 15 ≯ 40

c = W_L - 40 ≯ 20

d = I_p -10 ≯ 20

Where, p = % fraction pass through 75 μ sieve i.e. 35%

W_L = Liquid limit of soil i.e. 40%

I_P = Plasticity index i.e. 10%

So, a = 0, b = 20, c = 0, d = 0

Hence,

GI = 0.2 × 0 + 0.005 × 0 × 0 + 0.01 × 20 × 0

= 0

16. Answer B

Solution

As we know that

$S_r + S_y = n$

where,

Sr = Specific retention

Sy = specific yield

n = porosity

$0.15 + S_y = 0.35$

$S_y = 0.20$ ...(i)

Change in volume of storage in aquifer,

$\Delta V = S_y \times A \times d$

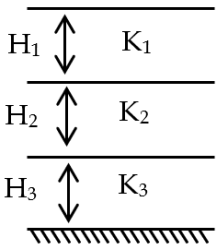
where, d = drop

$\Delta V = 0.20 \times 200 \times 10^4 \times 4$

$\Delta V = 1.6 \times 10^6\ m^3$

17. Answer A

Solution



$H_1 = 4m$

$H_2 = 2m$

$H_3 = 6m$

$K_1 = 30m / day$

$K_2 = 10m / day$

$K_3 = 20m / day$

Transmissivity = $K_1 H_1 + K_2 H_2 + K_3 H_3$

$= 30 \times 4 + 10 \times 2 + 20 \times 6 = 260\ m^2/day$

18. Answer A

Solution

DWG (Drawing) is the native and primary file format used for saving AutoCAD drawing files.

Here is what the other extensions mean:

DWT: Drawing Template (used for creating template files).

DWF: Design Web Format (used for sharing lightweight viewing files).

DXF: Drawing Exchange Format (used to share CAD data between different programs).

19. Answer D

Solution

Permeability of a soil decreases as organic matter in soil increases.

- entrap air block the flow of water in soil pre-results permeability decreases.

- K (Permeability) V/s effective stress (σ)

we know

$$K = C_v \gamma_w m_v$$

$$K = C_v \times \gamma_w \times \frac{a_v}{1+e_0}$$

$$K = C_v \times \gamma_w \times \frac{\Delta e}{1+e} \times \frac{1}{\Delta\sigma}$$

$$K \propto \frac{1}{\Delta\sigma}$$ **(K increase with decrease is $\Delta\sigma$)**

20. Answer C

Solution

Pore pressure parameter B lies in between 0 to 1 and **pore pressure parameter A** may be as low as -0.5 and may be as high as 3.

21. Answer C

Solution

In a saturated clay layer undergoing consolidation with single drainage at its top the pore water pressure could be the maximum at its bottom while in double drainage pore water pressure is maximum at its middle.

22. **Answer C**

Solution

Every time you manually save a drawing, AutoCAD automatically creates a backup copy of the previous version of your file with a **.bak** extension.

23. Answer B

Solution

$$K = D_{10}^2 \frac{\gamma_w}{\mu} \cdot \frac{e^3}{1+e} \cdot C$$

$$K \propto \frac{1}{\mu}$$

For high viscous fluid, μ is more

For low viscous fluid, μ is less

24. Answer C

Solution

Given as

G = 2.67

e= 0.67

Critical hydraulic gradient =

$$\frac{G-1}{1+e} = \frac{2.67-1}{1+0.67} = 1$$

$$FOS = \frac{i_{cr}}{i}, i = \frac{1.5}{d}$$

$$2 = \frac{1}{1.5/d}$$

$d = 2 \times 1.5 = 3m$

25. Answer D

Solution

Alt + B is not a standard keyboard shortcut or hotkey in AutoCAD.

Here is what the other combinations do:

Ctrl + P: Opens the Plot or Print dialog box to print your current drawing.

Alt + F4: Closes the main AutoCAD application window (standard Windows shortcut).

Ctrl + F4: Closes only the current active drawing file without closing the entire software

26. Answer C

Solution

1. Sheep foot rollers- are recommended for compacting cohesive soils, but are not considered effective on coarse grained cohesionless soils. In general, sheep foot rollers are most suited to silt, clay. The kneading action compacted layer compared to other types of rollers.
2. Smooth wheel rollers are most suited to crushed rock, hard core, mechanically stable gravel sand.
3. Pneumatic Tyred rollers is a combination of pressure and kneading and they are suitable both on cohesionless sand and gravels, and on cohesive soils.
4. Rammers are used for compacting soils in confined places.
5. Vibratory rollers- are useful for cohesionless soils.

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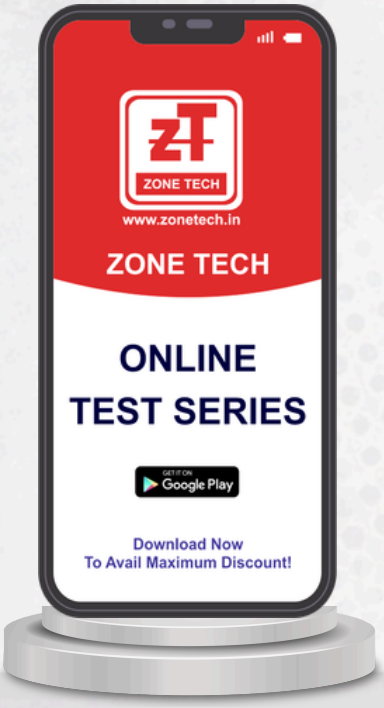

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27. **Answer D**

Solution

- Seepage force acts is the direction of flow. When flow is in downward direction seepage force will act in downward direction and this will increase the effective stress, by an amount equal to seepage force.
- While total stress at a section is equal to weight of soil (weight of solid + weight of water) at a section, divided by area at that section, so its is not affected by seepage force.

28. **Answer A**

Solution

Pressing **Ctrl + 1** opens or closes the **Properties Palette** in AutoCAD. This panel allows you to view and modify the attributes of selected objects, such as color, layer, line type, scale, and geometry details.

Here is what the other combinations do:

Ctrl + 2: Opens the **DesignCenter** palette (used to insert blocks, layers, and layouts from other files).

Ctrl + 3: Opens the **Tool Palettes** window (provides quick access to standard blocks, hatches, and commands).

Ctrl + 4: Opens the **Sheet Set Manager** palette (used to manage entire drawing sets and layouts).

29. **Answer A**

Solution

When a soil, whose present effective overburden pressure is the maximum pressure that it was subjected to in the past, then it is normally consolidated.

$$\text{Over Consolidation Ratio (OCR)} = \frac{\bar{\sigma}_0}{\bar{\sigma}}$$

where, $\bar{\sigma}_0$ = pre consolidation stress

$\bar{\sigma}$ = existing effective stress

30. **Answer B**

Solution

UN is the official command alias (shortcut) in AutoCAD used to open the **Drawing Units** dialogue box. Typing **UNITS** completely also works, but the short command alias is **UN**.

31. **Answer A**

Solution

Terzaghi's one dimensional consolidation theory assumes that unique relationship between the void ratio and effective stress is independent of time.

32. **Answer A**

Solution

Coefficient of consolidation normally increases with decreasing liquid limit of clay.

$$t = \frac{t_v d^2}{c_v}$$

$$c_v = \frac{k}{m_v \gamma_w}$$

33. **Answer D**

Solution

These commands use the **Polar Coordinate System** (@distance<angle) in AutoCAD to draw a square measuring 1000 units by 1000 units. Since 1000 millime**ters** equal 1 me**ter**, this creates a meter-by-meter square.

34. **Answer C**

Solution

Given

d = 10 m, Tv = 0.848, t = 10 year

$$T_v = \frac{C_v.t}{d^2} \Rightarrow C_v = \frac{0.848 \times (10)^2}{10}$$

C_V = 8.48m² / year

35. **Answer C**

Solution

Direct shear test-

- Oldest shear test still in used, quite simple to perform.
- Also called shear box test.
- Generally, shear is applied at constant rate of strain.
- Two types of application of shear are possible one in which the shear stress is controlled and the other in which the shear strain is controlled.
- Volume change can not be measured.
- Difficult to control drainage.
- Direction of failure plane is fixed.

36. **Answer B**

Solution

To draw a standard rectangle using the RECTANGLE (or REC) command, you only need to specify **two opposite corner points** (usually the bottom-left corner and the top-right corner). AutoCAD automatically calculates and draws the four sides based on these two diagonal inputs.

37. Answer B

Solution

Given Ai = 15 cm²

= 0.25

Corrected area (Af) = $\frac{A_i}{1-\varepsilon_L}$

= $\frac{15}{1-0.25}$

A_f = 20 cm²

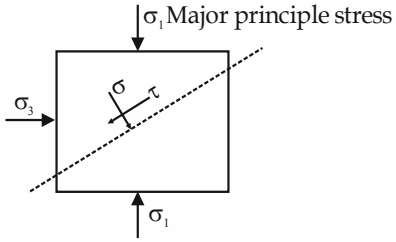
38. Answer D

Solution

Two stages of triaxial test are consolidation and shear respectively. If consolidation is allowed in first stage then it is drained test if not allowed then undrained test.

39. Answer B

Solution



The cohesion and internal friction angle are usually called shear strength parameter of soils.

$\tau = C + \sigma \tan\phi$

Pure clay $(\phi = 0)$

Pure sand $(c = 0)$

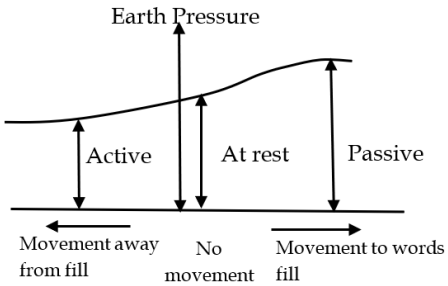
40. Answer D

Solution

'Sensitivity' of soil can be accessed from vane shear test.

41. Answer D

Solution



Hence, passive earth pressure is greater than earth pressure at rest and active earth pressure. Actuating elements are the elements causing instability. increasing order

$\boxed{K_a < K_0 < K_p}$

42. Answer B

Solution

Active earth pressure

$P_a = k_a\sigma_z - 2C\sqrt{k_a}$

$P_a = k_a(q + \gamma z) - 2C\sqrt{k_a}$

Given, at z = 0, P_s = 0

$0 = k_a q - 2C\sqrt{K_a}$

$q = \frac{2C}{\sqrt{k_a}}$

= $q = \frac{2C}{\sqrt{\frac{1}{\tan^2\left(45 + \frac{\phi}{2}\right)}}}$

$q = 2C\ \tan\left(45 + \frac{\phi}{2}\right)$

$q = 2C \tan\alpha$

where, α = Angle of failure plane with major principal plane.

$\alpha = 45 + \frac{\phi}{2}$

43. Answer C

Solution

- Active earth pressure on a retaining wall decrease due to increase in wall friction. Masonary retaining wall founded on compressible clay will move away from the backfill. So active earth pressure on wall.
- Rankine assumed the retaining wall as smooth and vertical.
- In other words, there are no shearing stress as between the wall and the soil and the stress relationship for any element adjacent to the wall is the same as for any other element for away from the wall.

44. Answer C

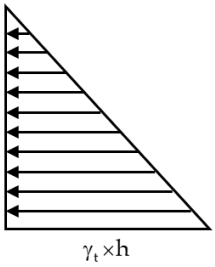
Solution

h = 10 m

γ_t = 15 kN/m³

$\phi = 30°$

$P_A = K_A\gamma_t \times h$



Active Pressure diagram

$$K_A = \tan^2\left(45 - \frac{\phi}{2}\right)$$

$$= \tan^2 30°$$

$$K_A = \frac{1}{3}$$

$$\therefore P_A = \frac{1}{3} \times 15 \times 10 = 50 kN/m^2$$

Active pressure per meter run

$$F_A = \frac{1}{2} K_a \gamma_t \times H^2 = \frac{1}{2} \times \frac{1}{3} \times 15 \times 10^2$$

$$\boxed{F_A = 250 kN}$$

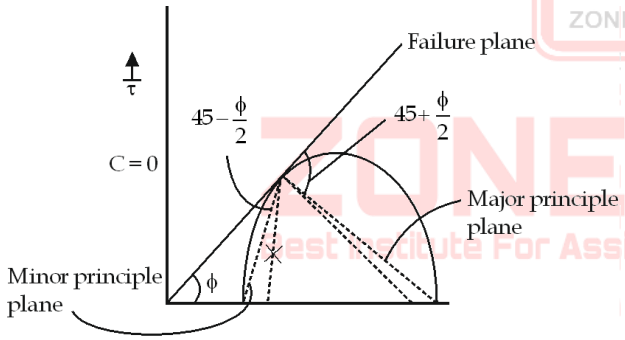
45. Answer D

Solution

Friction angle = ϕ

Angle between major principal plane & shearing plane = $45 + \frac{\phi}{2}$

Angle between minor principal plane & shearing plane = $45 - \frac{\phi}{2}$



46. Answer C

Solution

Wt. of container = 260 gm. = w_1

Wt. of soil sample = 320 gm. = w_2

Wt. of soil sample (dried) = 310 gm. = w_3

$$w_c = \left(\frac{w_2 - w_3}{w_3 - w_1}\right) \times 100 = \frac{320 - 310}{310 - 260} \times 100$$

$$= \frac{10}{50} \times 100 = 20\%$$

47. Answer A

Solution

In rigid footing, the settlement is constant and pressure varies. The given figure corresponds to the constant settlement and variable pressure. Here the pressure is minimum at edge, so this a case of rigid footing on granular soil.

48. Answer D

Solution

For cohesionless soil,

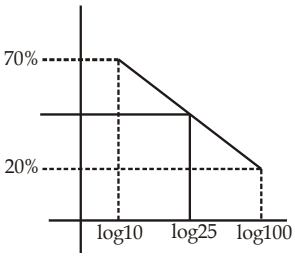
$$S_f = S_p \left[\frac{B_f\left(B_p + 0.3\right)}{B_p\left(B_f + 0.3\right)}\right]^2$$

$$= 5\left[\frac{5\left(0.3+0.3\right)}{0.3\left(5+0.3\right)}\right]^2 = 17.8 \text{ mm}$$

Note:- For clayey soil $\frac{S_f}{S_p} = \frac{B_f}{B_p}$

49. Answer D

Solution



$$\frac{70 - 20}{\log 100 - \log 10} = \frac{x - 20}{\log(25) - \log(10)}$$

$$\frac{50}{1} = \frac{x - 20}{\log 2.5}$$

$$x \simeq 40\%$$

50. Answer C

Solution

Ultimat bearing capacity for circular footing-

$$q_{u_c} = 1.3CN_c + \gamma D_f N_q + 0.3\gamma D N_\gamma$$

For square footing

$$q_{u_s} = 1.3CN_c + \gamma D_f N_q + 0.4\gamma B N_\gamma \quad [D = B]$$

For sandy soil, C = 0, for surface, D_f= 0.

Now, $\boxed{\frac{q_{u_s}}{q_{u_c}} = 1.33}$

51. Answer B

Solution

Dilatancy corrction is given as-

$$N = 15 + \frac{1}{2}(N_1 - 15)$$

here, $N_1 = 21$

So, $N = 15 + \frac{1}{2}(21 - 15)$

$$\boxed{N = 18}$$

52. Answer A

Solution

According to Rankine's formula, the minimum depth of foundation should be

$$\frac{P}{W}\left(\frac{1-\sin\phi}{1+\sin\phi}\right)^2 = D_f \text{ (Depth of foundation)}$$

Where P = safe permissible on base in kg / cm^2

w = weight of soil in kg / (m^3) and

ϕ = angle of repose of the soil

53. Answer A

Solution

Ans. (a): Ultimate Bearing Capacity > Net Ultimate Bearing Capacity > Gross Safe Bearing Capacity > Net Safe Bearing Capacity.

54. Answer A

Solution

Settlement analysis-

The total settlement is the sum of initial/immediately/Primary consolidation settlement and secondary consolidation.

(I) IS code Guidelines for permissible settlement-

For isolated footing on clay = 65mm

For isolated footing on sand = 40mm

For raft footing on clay = 65 – 100mm

For raft footing on sand = 40 - 65mm

(II) Permissible differential Settlement

For isolated footing on clay = 40mm

For isolated footing on sand = 25mm

55. Answer C

Solution

Rotation of soil particles in to a more stable state which occurs in the remoulding process is called thixotropy of soil.

56. Answer D

Solution

Aquifer:- It is a saturated formation of earth material which not only stores water but also yields water in sufficient quantity.

- **Unconfined aquifers** are sometimes also known as water table or phreatic aquifer.
- **Confined aquifers** also known as artesian aquifer, and it is confined between two impervious beds such as aquicludes or aquifuges.

57. Answer C

Solution

quicksand is a hydraulic condition occurring in cohesionless soils (like fine sands or silts) when upward water seepage completely destroys the soil's strength.

58. Answer A

Solution

Chunk samples is used for getting undisturbed sample they are obtained from bottom of the test pits for all type of soils.

59. Answer B

Solution

$$q_u = 300\,kN/m^2$$

$$D_f = 1m$$

$$\gamma = 20\,kN/m^3$$

$$FOS = 2.5$$

$$q_{ns} = \frac{q_u - \gamma D_F}{FOS}$$

$$= \frac{300 - 20(1)}{2.5}$$

$$= 112\,kN/m^2$$

60. Answer B

Solution

When ground water table is at the location of ground level

$$q_{u_{min}} = CN_c + qN_q + \frac{1}{2}\gamma_{sub}BN\gamma$$

$$= CN_c + \gamma_{sub}ZN_q + \frac{1}{2}\gamma_{sub}BN_\gamma$$

In this condition soil above and below the foundation is in submerged condition, this result in minimim bearing capacity

61. Answer A

Solution

Standard penetration test is recommended for cohesionless soils.

62. Answer D

Solution

For cohesive soil : Net ultimate bearing capacity

$q_{nu} = CNc$

It is independent of the size of footing and surcharge.

For cohesion less soil

$$q_{nu} = CN_c + q(N_q - 1) + \frac{1}{2}\gamma BN_r$$

$$q_{nu} \propto B$$

Size effect is imortant in case of cohesionless soil.

63. **Answer B**
Solution
Methods to determine field density
- Sand Replacement method
- Core Cutter Method
- Water Displacement Method

Methods to determine maximum dry density
- Proctor Compaction Test
- Modified Proctor Compaction Test

64. **Answer C**
Solution
In case of unconfined compression test minor principal stress ($\sigma_3 = 0$) is zero. So Mohr circle passes through the origin.

65. **Answer A**
Solution
1. **Analyzing Assertion (A)**
- Soil material fails primarily due to shear stress when it reaches its ultimate strength.
- This failure occurs along a specific plane known as the potential failure plane or critical plane.
- The strength of the soil is directly determined by evaluating the combination of shear and normal stresses acting exactly on this plane.
- Therefore, Assertion (A) is true.

2. **Analyzing Reason (R)**
- According to Mohr-Coulomb's Failure Criterion, the shear strength (τ_f) of a soil on the failure plane is given by the equation:
  $\tau_f = c + \sigma_n \tan\phi$
  Where c = cohesion (property of the soil)
  ϕ = angle of internal friction (property of the soil)
  σ_n = normal stress on the failure plane
- This equation shows that the critical shear stress causing failure explicitly depends on both the inherent soil properties (c, ϕ) and the normal stress (σ_n) acting on that plane.

Therefore, Reason (R) is true

66. **Answer D**
Solution
$$\frac{\left(\frac{\sigma_1 - \sigma_3}{2}\right)}{\left(\frac{\sigma_1 + \sigma_3}{2}\right)} = 1$$
$\Rightarrow \sigma_3 = 0$ This represents condition of unconfined compression test

67. **Answer B**
Solution
Liquefaction occurs in saturated fine sand due to increase of pore water pressure, which results into loss of shear strength of soil.
Increase of pore water pressure depends on
- Number of stress cycle: More is number of stress cycles, more is pore water pressure.
- Amplitude: Larger the amplitude, smaller the number of cycles required to cause liquefaction.
- Characteristics of sand: Associated with loose saturated fine and medium sand having low value of relative density.

68. **Answer A**
Solution
In AutoCAD, the POLYGON (or POL) command allows you to create regular polygons with a minimum of **3 sides** (a triangle) and a maximum of **1024 sides**. This upper limit is set by the system variable POLYSIDES to optimize software performance and geometry management

69. **Answer A**
Solution
In consolidation test, the load is applied in a series of four or more increments, usually 12.5, 25, 50, and 100 percent of the maximum load. The intensities to be used depend on the weight of the structure and the over-burden pressures that occur in the materials, and should be such values as to include the maximum anticipated pressure on the foundation.

70. **Answer C**
Solution
Assertion (A) is True
- Non-cohesive soils include sand and gravel.
- These soils have large spaces between particles.
- Water and air can escape almost instantly.
- Therefore, the soil settles immediately under a load.

Reason (R) is False
- Immediate settlement is primarily due to elastic deformation.
- It involves the quick compaction or shifting of particles.
- The correct reason for it happening immediately is the soil's high permeability.
- Lateral yielding and shear strains cause shape distortion, usually without significant volume changes.

71. **Answer A**
Solution
In traditional AutoCAD workflows, when you activate the TRIM (or TR) command, the software first prompts you to select the **cutting edges** (the boundaries that will act as a knife). After selecting the cutting edges and pressing Enter, you then select the **object to be trimmed** (the part you want to cut away).

72. Answer A

Solution

(1) Compression index (Cc) is given as-

$$C_c = \frac{-\Delta e}{\log_{10}\left(\frac{p_0 + \Delta_p}{p_0}\right)}$$

It is slope of the linear portion of void ratio v/s log p plot.

(2) Coefficient of volume chage (mv): It is defined as volumetric strain per unit increase in effective stress

$$m_v = \frac{-\Delta v / v_0}{\Delta p} = \frac{\Delta e}{\Delta p(1+e_0)}$$

(3) Coefficient of compressibility is defined as decrese in void ratio per unit increase in effective stress.

$$a_v = \frac{-\Delta e}{\Delta p}$$

(4) Coefficient of consolidation

$$C_v = \frac{k}{\gamma_w m_v}$$

73. Answer A

Solution

SM- Silty Sand
SC-Clayey Sand
GM-Silty Gravel
GC-Clayey Gravel
GW-Well graded gravel
SW-Well graded Sand
GP-Poorly graded gravel
SP-Poorly graded Sand

74. Answer B

Solution

Typing **DIMSTYLE** (or its shortest shortcut alias, **D**) and pressing Enter opens the **Dimension Style Manager** dialog box. This tool allows you to create, modify, and manage styles for lines, arrows, text, and primary units of your dimensions.

75. Answer D

Solution

Cyclic pile load test → Skin friction and point bearing resistance

- This test separates the total load-carrying capacity of a pile into its individual components: skin friction and end (point) bearing resistance.

Plate load test → Modulus of sub-grade reaction

- The slope of the load-settlement curve obtained from a plate load test is directly used to calculate the modulus of sub-grade reaction (k).

Pressure meter test → Elastic constants

- This in-situ test measures the stress-strain relationship of the soil to determine elastic parameters like the pressuremeter modulus (E_p).

Standard penetration test → Relative density and strength

- The SPT N-value is empirically correlated with the relative density of cohesionless soils and the shear strength parameters of the soil.

76. Answer C

Solution

$$e = \frac{n}{1-n} = \frac{0.5}{1-0.5} = 1$$

77. Answer C

Solution

The **SOLID** hatch pattern fills a closed boundary completely with a single, solid color. This pattern does not contain lines or textures.

78. Answer D

Solution

For 2 dimensional, $K_{eq} = (K_x.K_y)^{1/2}$

For 3 dimensional, $K_{eq} = (K_x.K_y.K_z)^{1/3}$

79. Answer B

Solution

- **Increase in total stress:** Total stress immediately increases upon load application.
- **Development of excess pore pressure:** Load is initially taken entirely by pore water, creating excess pore water pressure.
- **Decrease in excess pore pressure:** Water gradually drains out over time, reducing excess pore pressure.
- **Increase in effective stress:** As pore pressure dissipates, effective stress increases correspondingly to bear the load.

80. Answer A

Solution

Consistency index

$$I_c = \frac{w_L - w}{w_L - w_p}$$

when

$I_c = 0 \Rightarrow w = w_L$

W = Natural water content

w_L = liquid limit

w_p = plastic limit