Soil Mechanics Exam.

الاسئلة المتوسطة لمادة ميكانيك التربة بنسبة (٥٠٪) مع الاجوبة النموذجية

1- Soil Origin and Rock (15%)

Question No. 01

Coarse-grained soils formed from _____.

(A) Mechanical weathering
(B) Chemical weathering
(C) Mechanical and Chemical weathering
(D) Acids and salts reactions with minerals
(E) None of the above

Answer: Option (A)

Question No. 02

Mechanical weathering of soils is caused by?

(A) periodical temperature change
(B) splitting action of flowing water
(C) splitting action of ice
(D) disintegration of rocks into smaller particle sizes by wind action.
(E) all of these

Answer: Option (E)

Question No. 03

The particle size range is measured by?

(A) effective size
(B) curvature coefficient
(C) uniformity coefficient
(D) compressibility coefficient
(E) none of the above

Answer: Option (C)

Question No. 04

Clay minerals are complex aluminum silicates composed of?

(A) Silica Tetrahedron only
(B) Alumina Octahedron only
(C) Silica Tetrahedron and Alumina Octahedron
(D) Silica Octahedron and Alumina Tetrahedron
(E) none of the above

Answer: Option (C)

Question No. 05

The degree of saturation in a soil unit is?

(A) The percentage of void volume which is filled with water
(B) The percentage of total volume which is filled with water
(C) the ratio of voids volume to solids volume.
(D) the weight percentage of water to soil solids
(E) the percent of void volume to total volume.

Answer: Option (A)

Question No. 06

The Plasticity Index (PI) is:

(A) the difference between the liquid limit and the plastic limit of soil.
(B) the difference between the shrinkage limit and the plastic limit of soil.
(C) the difference between the liquid limit and the shrinkage limit of soil.
(D) the difference between the liquidity index and the plastic limit of soil
(E) none of the above.

Answer: Option (A)

2- Classification of Soil (5%)

Question No. 07

In the Unified Soil Classification System (USCS), fine-grained soils are the soils with _____ passing through the No. 200 sieve.

(A) 50% or more
(B) 50% or less
(C) 50%
(D) 12% or more
(E) 5% or more

Answer: Option (A)

Question No. 08

The soils which plot above the A line in a plasticity chart are known as:

(A) clays
(B) sands
(C) silts
(D) organic soils

(E) none of the above

Answer: Option (A)

3- Soil Compaction (10%)

Question No. 09

In the Modified compaction test, the soil is compacted into _____ layers.

(A) 5
(B) 10
(C) 3
(D) 7
(E) none of the above

Answer: Option (A)

Question No. 10

In Standard Proctor Compaction Test. The volume of mold equal to:

(A) $0.0094\ m^3$
(B) $\frac{1}{25} ft^3$
(C) $943.9\ cm^3$
(D) $\frac{1}{40} ft^3$
(E) none of the above

Answer: Option (C)

Question No. 11

In Modified Proctor Compaction Test, the height of drop of hammer is:

(A) 18 in.
(B) 10 in.
(C) 12 in.
(D) 20 in.
(E) none of the above

Answer: Option (A)

Question No. 12

Zero-Air-Void Unit Weight equal to:

(A) $\frac{\gamma_w}{\frac{w(\%)}{100}+\frac{1}{e}}$

(B) $\frac{\gamma_w}{e+\frac{1}{G_s}}$

(C) $\frac{\gamma_w}{\frac{w(\%)}{100}+e}$

(D) $\frac{\gamma_w}{\frac{w(\%)}{100}+\frac{1}{G_s}}$

(E) $\frac{\gamma_w}{\frac{w(\%)}{100}+G_s}$

Answer: Option (D)

4- Flow in Soils (15%)

Question No. 13

In the falling head permeability test, the coefficient of permeability, *k* qual to:

(A) $k = 2.303\frac{aL}{At}\log\frac{h_1}{h_2}$
(B) $k = 2.303\frac{aL}{At}\log\frac{h_2}{h_1}$
(C) $k = 2.303\frac{aL}{At}\ln\frac{h_1}{h_2}$
(D) $k = 2.303\frac{aL}{At}\ln\frac{h_2}{h_1}$
(E) none of the above

Answer: Option (A)

Question No. 14

The quantity of seepage of water in a soil medium is?

(A) directly proportional to the head of water at upstream
(B) inversely proportional to the head of water at upstream
(C) directly proportional to the coefficient of permeability
(D) inversely proportional to the coefficient of permeability

(E) none of the above

Answer: Option (C)

Question No. 15

The exit gradient of the seepage of water through a soil medium is the?

(A) slope of the flow line
(B) slope of the equipotential
(C) ratio of total head to the length of seepage
(D) ratio of the head loss to the length of seepage
(E) none of the above

Answer: Option (D)

Question No. 16

When applying Darcy's law to soils, it is assumed that the?

(A) soil is incompressible
(B) soil is homogeneous and isotropic
(C) flow conditions are laminar
(D) all of these
(E) none of the above

Answer: Option (D)

Question No. 17

The critical gradient for all soils is normally?

(A) 0.5
(B) 1.0
(C) 1.5
(D) 2.0
(E) 2.5

Answer: Option (B)

Question No. 18

Flow lines and equipotential lines are?

(A) perpendicular to each other
(B) parallel to each other
(C) intersecting lines at 90° to each other
(D) intersecting lines at 45° to each other
(E) none of the above

Answer: Option (C)

5- Effective Stress Concept (10%)

Question No. 19

Quick sand is a?

(A) moist sand containing small particles
(B) condition which occurs in coarse sand
(C) condition in which a cohesionless soil loses all its strength because of upward flow of water
(D) Loose sand
(E) none of the above

Answer: Option (C)

Question No. 20

The critical gradient of the seepage of water?

(A) directly proportional to void ratio
(B) increases with the decrease in void ratio
(C) inversely proportional to specific gravity
(D) increases with the decrease in specific gravity of soil
(E) none of the above

Answer: Option (B)

Question No. 21

The critical gradient of the seepage of water, i_{cr} equal to:

(A) $i_{cr} = \frac{G_s - 1}{1+e}$
(B) $i_{cr} = \frac{G_s + 1}{1+e}$
(C) $i_{cr} = \frac{G_s - 1}{1-e}$
(D) $i_{cr} = \frac{G_s}{1+e}$
(E) $i_{cr} = \frac{G_s}{1-e}$

Answer: Option (A)

Question No. 22

The effective stresses in saturated soil with upward seepage equal to:

(A) $\sigma' = \gamma' z - iz\gamma_w$
(B) $\sigma' = \gamma' z + iz\gamma_w$
(C) $\sigma' = \gamma_{sat} z - iz\gamma_w$
(D) $\sigma' = \gamma' z - iz\gamma_{sat}$

(E) $\sigma' = \gamma_{sat} z - iz\gamma'$

Answer: Option (A)

6- Stress in Soil Mass (5%)

Question No. 23

For a sandy soil, the angle of internal friction is 30°. If the major principal stress is 50 kN/m² at failure, the corresponding minor principal stress will be?

(A) 12.2 kN/m^2
(B) 16.66 kN/m^2
(C) 20.8 kN/m^2
(D) 27.2 kN/m^2
(E) none of the above

Answer: Option (B)

Question No. 24

The Major Principal Stress equal to:

(A) $\sigma_1 = \frac{\sigma_y + \sigma_x}{2} + \sqrt{\left[\frac{\sigma_y - \sigma_x}{2}\right]^2 + \tau_{xy}^2}$
(B) $\sigma_1 = \frac{\sigma_y + \sigma_x}{2} - \sqrt{\left[\frac{\sigma_y - \sigma_x}{2}\right]^2 + \tau_{xy}^2}$
(C) $\sigma_1 = \frac{\sigma_y + \sigma_x}{2} + \sqrt{\left[\frac{\sigma_y - \sigma_x}{2}\right]^2 - \tau_{xy}^2}$
(D) $\sigma_1 = \frac{\sigma_y + \sigma_x}{2} - \sqrt{\left[\frac{\sigma_y - \sigma_x}{2}\right]^2 - \tau_{xy}^2}$
(E) none of the above

Answer: Option (A)

7- Compressibility of Soil (20%)

Question No. 25

The coefficient of consolidation of a soil is affected by?

(A) compressibility
(B) permeability
(C) shear strength
(D) both (A) and (B)
(E) both (A) and (C)

Answer: Option (D)

Question No. 26

The compression index of the soil?

(A) increases with the increase in liquid limit
(B) decreases with the increase in liquid limit
(C) increases with the decrease in plastic limit
(D) decreases with the increase in plastic limit
(E) none of the above

Answer: Option (A)

Question No. 27

The consolidation of a soil is defined as the?

(A) process of compression by gradual reduction of pore space under steady load
(B) process which gives gradual decrease of water content at constant load
(C) change in volume of soil due to expulsion of pure water under an applied load
(D) the process in which the volume of a saturated (partially or fully) soil decreases due to an applied stress
(E) any one of the above

Answer: Option (E)

Question No. 28

The time factor for a clay layer is?

(A) a dimensionless parameter
(B) directly proportional to permeability
(C) directly proportional to drainage
(D) directly proportional to shear strength
(E) none of the above

Answer: Option (B)

Question No. 29

The overconsolidation ratio (OCR) is?

(A) the maximum overburden stress ever experienced by the soil to the present overburden stress.
(B) present overburden stress to the maximum overburden stress ever experienced by the soil.
(C) total settlement to the consolidation settlement
(D) overburden stress to the applied stress
(E) none of the above

Answer: Option (A)

Question No. 30

For NC clays that exhibit a linear e–log $\acute{\sigma}$ relationship, the consolidation settlement is?

(A) $S_c = \frac{C_c H_o}{1-e_o} \log \frac{\sigma_o' + \Delta\sigma'}{\sigma_o'}$

(B) $S_c = \frac{C_c H_o}{1+e_o} \log \frac{\sigma_o' - \Delta\sigma'}{\sigma_o'}$

(C) $S_c = \frac{C_r H_o}{1+e_o} \log \frac{\sigma_o' + \Delta\sigma'}{\sigma_o'}$

(D) $S_c = \frac{C_c H_o}{1+e_o} \log \frac{\sigma_o' + \Delta\sigma'}{\sigma_o'}$

(E) none of the above

Answer: Option (D)

Question No. 31

Skempton (1944) suggested the following empirical expression for the compression index for undisturbed clays?

(A) $C_c = 0.009(LL - 10)$
(B) $C_c = 0.009(LL + 10)$
(C) $C_c = 0.9(LL - 10)$
(D) $C_c = 0.09(LL - 10)$
(E) $C_c = 0.09(LL + 10)$

Answer: Option (A)

8- Shear Strength of Soil (20%)

Question No. 32

What will be the shearing resistance of a sample of clay in an unconfined compression test, falls under a load of 150 N? Take change of cross-section Af=2181.7 mm^2?

(A) 68.75 kN/m^2
(B) 34.38 kN/m^2
(C) 11.35 kN/m^2
(D) 0.6875 kN/m^2
(E) none of the above

Answer: Option (B)

Question No. 33

The shear strength in cohesion less soil is due to _____

(A) Internal friction
(B) Cohesion
(C) Intergranular friction
(D) Interparticle force
(E) none of the above

Answer: Option (C)

Question No. 34

The critical shear stress causing failure of material depends upon _____

(A) Properties of the material and normal stress on the plane
(B) Intermediate principal stress
(C) Soil type
(D) None of the mentioned
(E) All of the mentioned

Answer: Option (A)

Question No. 35

The curve obtained by plotting the normal and shear stress is called as:

(A) Mohr's envelope
(B) Shear envelope
(C) Strength envelope
(D) Stress envelope
(E) None of the mentioned

Answer: Option (C)

Question No. 36

Mohr envelope can be considered to be straight if the angle of internal friction φ is assumed to be:

(A) = 90^o
(B) >90^o
(C) <90^o
(D) = 45^o
(E) None of the mentioned

Answer: Option (E)

Question No. 37

The shear strength in cohesionless soil is due to _____

(A) Internal friction angle
(B) Cohesion
(C) normal stress
(D) both (A) and (C)
(E) None of the mentioned

Answer: Option (D)

Question No. 38

In unconfined compression test the value of σ_2 and σ_3 is equal to _____

(A) 1.0
(B) 0.0
(C) 2.0
(D) 0.5
(E) None of the mentioned

Answer: Option (B)