

## GEOTECH ENGINEERING

1. In a liquid limit test, the moisture content at 10 blows was 70% and that at 100 blows was 20%. The liquid limit of the soil, is
  - A.35%
  - B.50%
  - C.65%**
  - D.none of these.

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2. The active earth pressure of a soil is proportional to (where  $\phi$  is the angle of friction of the soil)
  - A. $\tan(45^\circ - \phi)$
  - B. $\tan^2(45^\circ + \phi/2)$
  - C. $\tan^2(45^\circ - \phi/2)$**
  - D. $\tan(45^\circ + \phi)$

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3. The minimum water content at which the soil just begins to crumble when rolled into threads 3 mm in diameter, is known
  - A.liquid limit
  - B.plastic limit**
  - C.shrinkage limit
  - D.permeability limit.

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4. Pick up the correct statement from the following:
  - A.The rise of the ground surface due to frost action is called frost heave.
  - B.The freezing of water is accompanied by a volume increase of 9%.
  - C.Below freezing point, higher soil suction develops.
  - D.The magnitude of frost heave decreases as the degree of saturation of soil decreases
  - E.All the above.**

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5. Which one of the following statements is true ?
  - A.Clays are more porous than sands
  - B.Pressure of organic matter in a soil decreases the bearing capacity of the soil
  - C.Aluminous cement is used for foundations in soils with chemical deposits
  - D.All the above.**

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6. The lateral earth pressure on a retaining wall
  - A.is equal to mass of the soil retained
  - B.proportional to the depth of the soil
  - C.proportional to the square of the depth of the soil
  - D.proportional to the internal friction of the soil**
  - E.none of these.

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7. The internal molecular attraction of a soil, the cohesion
- [A.](#)decreases as the moisture content increases
  - [B.](#)increases as the moisture content decreases
  - [C.](#)is more in well compacted clays**
  - [D.](#)depends upon the external applied load.
- 
8. The quantity of seepage of water through soils is proportional to
- [A.](#)coefficient of permeability of soil
  - [B.](#)total head loss through the soil
  - [C.](#)neither (a) nor (b)
  - [D.](#)both (a) and (b).**
- 
9. When drainage is permitted under initially applied normal stress only and full primary consolidation is allowed to take place, the test is known as
- [A.](#)quick test
  - [B.](#)drained test
  - [C.](#)consolidated undrained test**
  - [D.](#)none of these.
- 
10. The minimum water content at which the soil retains its liquid state and also possesses a small shearing strength against flowing, is known
- [A.](#)liquid limit**
  - [B.](#)plastic limit
  - [C.](#)shrinkage limit
  - [D.](#)permeability limit.
11. Minimum size of the particles of silt soil, is
- [A.](#)0.002 mm**
  - [B.](#)0.04 mm
  - [C.](#)0.06 mm.
  - [D.](#)0.08 mm
  - [E.](#)1 mm
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12. The maximum value of effective stress in the past divided by the present value, is defined as over consolidation ratio (OCR). The O.C.R. of an over consolidated clay is
- [A.](#)less than 1
  - [B.](#)1
  - [C.](#)more than 1**
  - [D.](#)None of these.
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13. If  $N_f$ ,  $N_d$  and  $H$  are total number flow channels, total number of potential drops and total hydraulic head differences respectively, the discharge  $q$  through the complete flow is given by (where  $K$  is a constant)

A.  $q = \sqrt{H} \cdot \frac{N_f}{N_d}$

**B.**  $q = KH \cdot \frac{N_d}{N_f}$

C.  $q = KH \cdot \frac{N_f}{N_d}$

D.  $q = KH \sqrt{\frac{N_f}{N_d}}$

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14. A flow line makes angles  $\theta_1$  and  $\theta_2$  with the normal to the interface of the soils having permeabilities  $k_1$ ,  $k_2$  before and after deflection. According to the law of deflection of the flow lines at the interface of the dissimilar soils

A.  $\frac{\sin \theta_1}{\sin \theta_2} = \frac{k_1}{k_2}$

**B.**  $\frac{\cos \theta_1}{\cos \theta_2} = \frac{k_1}{k_2}$

C.  $\frac{\tan \theta_1}{\tan \theta_2} = \frac{k_1}{k_2}$

D.  $\frac{\tan \theta_2}{\tan \theta_1} = \frac{k_1}{k_2}$

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15. Under-reamed piles are generally

A. driven piles

**B. bored piles**

C. precast piles

D. all the above.

16. Pick up the clay soil group which does not swell when wet from the following :

A. Kaolinite group

**B. Mite group**

C. Vermiculite group

D. Montmorillonite group.

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17. Factor of safety against sliding of a slope, is the ratio of

A. actual cohesion to that required to maintain stability of slope

**B.** shear strength to shear stress along the surface

C. neither (a) nor (b)

**D. both (a) and (b).**

18. The ratio of the volume of voids to the volume of soil solids in a given soil mass, is known

- A. porosity
  - B. specific gravity
  - C. void ratio**
  - D. water content.
- 

19. A compacted soil sample using 10% moisture content has a weight of 200 g and mass unit weight of  $2.0 \text{ g/cm}^3$ . If the specific gravity of soil particles and water are 2.7 and 1.0, the degree of saturation of the soil is

- A. 11.1%
  - B. 55.6%**
  - C. 69.6%
  - D. none of these.
- 

20. A partially saturated sample of soil has a unit weight of  $2.0 \text{ g/cm}^3$  and specific gravity of soil particles is 2.6. If the moisture content in the soil is 20%, the degree of saturation is

- A. 20%
  - B. 77%
  - C. 92%**
  - D. none of these.
- 

21. Minimum depth of a footing carrying a heavy load, is calculated by the formula

- A.  $d = \sqrt{\frac{3W}{4fL}} (L + 1)$
  - B.  $d = \sqrt{\frac{3W}{4fL}} (L - 1)$
  - C.  $d = (L - 1) \sqrt{\frac{4fL}{3W}}$
  - D.  $d = (L - 1) \sqrt{\frac{2W}{3fL}}$
- 

22. According to Coulomb's wedge theory, the active earth pressure slides the wedge

- A. down and outwards on a slip surface**
  - B. up and inwards on a slip surface
  - C. horizontal upward and parallel to base
  - D. horizontal inward and parallel to base.
-

23. The coefficient of curvature is defined

- A.  $\frac{D_{60}}{D_{10}}$   
B.  $\frac{D_{10}}{D_{60}}$   
C.  $\frac{D_{30}^2}{D_{60}D_{10}}$   
D.  $\frac{D_{10}^2}{D_{30}D_{60}}$
- 

24. The effective size of particles of soil is denoted by

- A.  $D_{10}$  B.  $D_{20}$   
C.  $D_{30}$  D.  $D_{60}$
- 

25. Degree of saturation of a natural soil deposit having water content 15%, specific gravity 2.50 and void ratio 0.5, is

- A. 50% B. 60%  
C. 75% D. 80%
- 

26. The coefficient of compressibility of soil, is the ratio of

- A. stress to strain  
B. **strain to stress**  
C. stress to settlement  
D. rate of loading to that of settlement.
- 

27. If the failure of a finite slope occurs through the toe, it is known as

- A. slope failure  
B. face failure  
C. base failure  
D. **toe failure.**
- 

28. Rankine's theory of active earth pressure assumes

- A. soil mass is homogeneous, dry and cohesionless  
B. ground surface is a plane which may be horizontal or inclined  
C. back of the wall is vertical and smooth  
D. wall yields about the base  
E. **all the above.**
- 

29. The water content of soil is defined as the ratio of

- A. volume of water to volume of given soil  
B. volume of water to volume of voids in soil  
C. weight of water to weight of air in voids  
D. **weight of water to weight of solids of given mass of soil.**

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30. Accurate determination of water content, is made by

- A. calcium carbide method
- B. sand bath method
- C. alcohol method
- D. oven-drying method.**

31. Stoke's law states that the velocity at which a grain settles out of suspension, the other factors remaining constant, is dependent upon

- A. shape of grain
- B. weight of grain
- C. size of grain
- D. shape and size of grain
- E. shape, size and weight of grain.**

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32. Pick up the correct statement from the following:

- A. When water table is above the base of a footing, the dry weight  $m$  should be used for soil below water table  
**When water table is located somewhat below the base of a footing, the elastic wedge is B. partly of moist soil and partly of submerged soil, and a suitable reduction factor is used**
- C. When water table is just at the base of the footing, no reduction factor is used
- D. None of these.

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33. Pick up the correct statement from the following :

- A. In soils, the flow index indicates variation in shear strength with water content
- B. Liquid limit minus plastic limit, is known as plasticity index of the soil
- C. Plastic limit minus shrinkage limit, is known as shrinkage index of the soil
- D. The ratio of the plasticity index to the flow limit, is known as toughness index of the soil
- E. All the above.**

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34. If  $S$ ,  $L$  and  $R$  are the arc length, long chord and radius of the sliding circle then the perpendicular distance of the line of the resultant cohesive force, is given by

A.  $a = \frac{S.R}{L}$

B.  $a = \frac{L.S}{R}$

C.  $a = \frac{L.R}{S}$

- D. none of these.
-

35. The liquid limit and plastic limit exist in  
A.sandy soils  
B.silty soils  
C.gravel soils  
**D.clay soils.**
36. Back fill with a sloping surface exerts a total active pressure  $P_a$  on the wall of height  $H$  and acts at  
A. $H/4$  above the base parallel to base  
B. $H/2$  above the base parallel to base  
**C. $H/3$  above the base parallel to base**  
D. $H/5$  above the base parallel to base.
- 
37. The ratio of the weight of given volume of soil solids to the weight of an equal volume of distilled water at the given temperature, is known  
A.porosity  
**B.specific gravity**  
C.void ratio  
D.water content.
- 
38. The ultimate Settlement of a soil is directly proportional to:  
A.depth of the compressible soil strata  
B.compressive index  
C.void ratio  
**D.both (a) and (b)**  
E.none of these.
- 
39. The seepage force in a soil, is  
A.perpendicular to the equipotential lines  
B.proportional to the exit gradient  
C.proportional to the head loss  
**D.all the above.**
- 
40. A soil has bulk density  $2.30 \text{ g/cm}^3$  and water content 15 per cent, the dry density of the sample, is  
A. $1.0 \text{ g/cm}^2$   
B. $1.5 \text{ g/cm}^3$   
**C. $2.0 \text{ g/cm}^3$**   
D. $2.5 \text{ g/cm}^3$

41. Pick up the correct statement from the following:

- A.Sandy clayloam contains highest percentage of sand
  - B.Silty clayloam contains highest percentage of silt**
  - C.Stiff boulder clay offers maximum shear strength
  - D.Soft chalk carries least safe load
  - E.All the above.
- 

42. The clay soil mainly consists of

- A.Kaolinites .
  - B.Montomorillonite
  - C.Illites
  - D.Vermiculite
  - E.All the above.**
- 

43. The liquidity index is defined as a ratio expressed as percentage of

- A.plastic limit minus the natural water content, to its plasticity index
  - B.natural water content minus its plastic limit to its plasticity index**
  - C.natural water content plus its plastic limit to its plasticity index
  - D.liquid limit minus the natural water content to the plasticity index.
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44. The fluid generally used for grouting is

- A.cement and water mix
  - B.clay suspension
  - C.sodium silicate
  - D.bitumen emulsion
  - E.all the above.**
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45. A coarse-grained soil has a voids ratio 0.75, and specific gravity as 2.75. The critical gradient at which quick sand condition occurs, is

- A.0.25
  - B.0.50
  - C.0.75
  - D.1.00**
- 

46. The relationship between void ratio (e) and porosity ratio (n) is :

A.  $n = \frac{1 + e}{1 - e}$

B.  $e = \frac{1 + n}{1 - e}$

C.  $n = \frac{e}{1 - e}$

**D.  $e = n/(1 - n)$**

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47. Failure of the stability of slopes, generally occurs along

- A. slip plane
- B. a horizontal surface
- C. a curved surface**
- D. all the surfaces.

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48. Pick up the correct statement from the following:

- A. Failure plane carries maximum shear stress
- B. Failure plane does not carry maximum shear stress**
- C. Failure plane carries shear stress equal to maximum shear stress
- D. None of these.

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49. Geologic cycle for the formation of soil, is

- A. Upheavel → transportation → deposition → weathering
- B. Weathering → upheaval → transportation → deposition
- C. Transportation → upheaval → weathering → deposition
- D. Weathering → transportation → deposition → upheaval**
- E. None of these.

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50. The weight of a pycnometer containing 400 g sand and water full to the top is 2150 g. The weight of pycnometer full of clean water is 1950 g. If specific gravity of the soil is 2.5, the water content is

- A. 5%
- B. 10%
- C. 15%
- D. 20%**

**SECTION 2**

1. The maximum shear stress occurs on the filament which makes an angle with the horizontal plane equal to  
A.30° B.**45°**  
C.60° D.90°
- 
2. For determining the moisture content of a soil sample, the following data is available Weight of container = 260 g, Weight of soil sample and = 320 g container, Weight of soil sample (dried) and = 310 g container. The moisture content of the soil sample, is  
A.15% B.18%  
C.**20%** D.25%
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3. Buoyant unit weight equals the saturated density  
A.multiplied by unit weight of water  
B.divided by unit weight of water  
C.plus unit weight of water  
D.**minus unit weight of water.**
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4. Pick up the correct statement from the following:  
A.**An unconfined compression test is a special case of triaxial compression test**  
B.An unconfined compression test is a special case of direct shear test  
C.The confining pressure is maximum during an unconfined compression test  
D.The cylindrical specimen of a soil is subjected to major principal stress till it fails due to shearing along the plane of the failure.
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5. A partially saturated soil is classified as  
A.one phase soil  
B.two phase soil  
C.**three phase soil**  
D.four phase soil.
- 
6. Pick up the in-correct statement from the following: The soils which contain montmorillonite minerals  
A.swell more when wet  
B.shrink more when dry  
C.possess high plasticity  
D.**possess high coefficient of internal coefficient**  
E.None of these.
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7. For determining the specific gravity of soil solids, using a pycnometer of 500 cc., the following data is available : Weight of dry empty pycnometer = 125 g Weight of dried soil and pycnometer = 500 g Weight of dried soil and distilled = 850 g water filled in pycnometer up to top The specific gravity of soil solids, is  
A.2.0 B.2.25  
C.**2.50** D.2.75

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8. Pick up the correct statement from the following:

- A. Kaolinite is most stable clay
- B. Kaolinite shows a very little sign of swelling on wetting
- C. Kaolinite when wet, becomes moderately plastic because negative electro magnetic charges on platelets attract water
- D. Kaolinite is also called China clay
- E. All the above.**

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9. A pile is being driven with a drop hammer weighing 1800 kg and having a free fall of 1.00 m. If the penetration with last blow is 5 mm, the load carrying capacity of the pile, -according to the Engineering News formula, is

- A. 100 tonnes
- B. 50 tonnes
- C. 20 tonnes
- D. 10 tonnes.**

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10. If the specific gravity and voids in soil sample are  $G$  and  $e$  respectively, the hydraulic gradient  $i$ , is

- A.  $\frac{G - 1}{1 + e}$
- B.  $\frac{G + 1}{1 - e}$
- C.  $\frac{1 - G}{1 + e}$
- D.  $\frac{1 + G}{1 + e}$

11. Pick up the correct statement from the following :

- A. To an agriculturist, soil is the substance existing on the earth's surface, which grows and develops plants
- B. To a geologist, soil is the material in a relatively thin surface zone within which roots occur, and rest of the crust is termed as rock irrespective of hardness
- C. To an engineer, soil is the unaggregated and uncemented deposits of minerals and organic particles covering the earth's crust
- D. All the above.**

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12. The ratio of settlement at any time 't' to the final settlement, is known as

- A. co-efficient of consolidation
  - B. degree of consolidation**
  - C. consolidation index
  - D. consolidation of undisturbed soil.
-

13. The Westergaard analysis is used for

- A. sandy soils
- B. cohesive soils
- C. stratified soils**
- D. clayey soils.

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14. If  $L$  and  $B$  are the length and breadth of a footing,  $e$  the eccentricity along the length and  $P$  and  $Q$  are the axial force and bearing capacity of the soil, then, to avoid tension,

A.  $BL = \frac{P}{Q} \left( 1 + \frac{6e}{L} \right)$

B.  $BL = \frac{Q}{P} \left( 1 + \frac{6e}{L} \right)$

C.  $BL = \frac{P}{Q} \left( 1 - \frac{6e}{L} \right)$

D.  $BL = \frac{P}{Q} \left( 1 - \frac{3e}{L} \right)$

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15. 260 g of wet soil was taken in a pycnometer jar of weight 400 g in order to find the moisture content in the soil, with specific gravity of soil particles 2.75. The weight of soil and remaining water filled in pycnometer without air bubbles was 1415 g and the weight of pycnometer filled with water alone was 1275 g. The moisture content in the soil is

- A. 24.2%
- B. 18.2%**
- C. 53.8%
- D. none of these.

16. The earth pressure of a soil at rest, is proportional to (where  $\phi$  is the angle of internal friction of the soil)

- A.  $\tan (45^\circ - \phi)$
- B.  $\tan (45^\circ + \phi)$
- C.  $\tan^2 (45^\circ - \phi)$
- D.  $\tan^2 (45^\circ + \phi)$
- E. none of these**

17. A fundamental equation of void ratio( $e$ ), specific gravity ( $G$ ), water content ( $\omega$ ) and degree of saturation ( $S_r$ ) is

A.  $e = \frac{\omega G}{S_r}$

B.  $\omega = \frac{eG}{S_r}$

C.  $G = \frac{e\omega}{S}$

D.  $S_r = \frac{e\omega}{G}$

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18. The critical exist gradient of seepage water in soils, is

A. directly proportional to the voids ratio

B. inversely proportional to the specific gravity

C. directly proportional to the specific gravity

D. inversely proportional to the voids ratio

E. none of these.

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19. Water content of a soil sample is the difference of the weight of the given sample at the given temperature and the weight determined after drying it for 24 hours at temperature ranging from

A. 80° to 90°C

B. 90° to 95°C

C. 95° to 100°C

D. 103° to 105°C

E. 105° to 110°C

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20. The ratio of the volume of voids to the total volume of the given soil mass, is known

A. porosity

B. specific gravity

C. void ratio

D. water content.

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21. The compression index of a soil

A. decreases with an increase in the liquid limit

B. increases with an increase in the liquid limit

C. decreases with an increase in the plastic limit

D. is not related with plastic limit.

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22. Pick up the correct statement from the following:

A. The void space between the soil grains, is filled partly with air and partly with water

B. In perfectly saturated soil, the voids are completely filled with water

C. In dry soil, the voids are completely filled with air

D. all the above.

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23. For a homogeneous earth dam 50 m high having 2 m free broad, a flow net was constructed and the results were : Number of potential drops = 2.4 Number of flow channels = 0.4. If coefficient of permeability of the dam material is  $3 \times 10^{-3} \text{ cm}^3/\text{sec}$ , the discharge per metre length of dam, is

A.  $12 \times 10^{-5} \text{ m}^3/\text{sec}$

B.  $24 \times 10^{-3} \text{ m}^3/\text{sec}$

C.  $6 \times 10^{-5} \text{ m}^3/\text{sec}$

**D.**  $24 \times 10^{-5} \text{ m}^3/\text{sec}$

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24.  $W$  is the weight of soil having a moisture content  $\omega$ . If  $V$  is the volume of proctor's mould, the dry density of the soil is

A.  $\frac{WV}{1 + w}$

B.  $\frac{V}{w(1 + w)}$

C.  $\frac{W}{V(1 + w)}$

D.  $\frac{V(1 + w)}{W}$

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25. For shear strength, triaxial shear test is suitable because

A. it can be performed under all three drainage conditions

B. precise measurement of the pore pressure and volume change during the test is possible

C. stress distribution on the failure plane, is uniform

D. state of stress within the specimen during any stage of the test as well as at failure, is

D. completely determined

**E.** all the above.

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26. The degree of saturation of the soil sample stated in Q. No, 216, is

A. 60%

B. 62%

**C.** 64%

D. 66%

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27. Number of piles required to support a column, is

A. 1

B. 2

**C.** 3

D. 4

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28. The soil moisture driven off by heat, is called

A. free water

**B.** hydroscopic water

C. gravity water

D. none of these.

29. If the specific gravity of a soil particle of 0.05 cm diameter is 2.67, its terminal velocity while settling in distilled water of viscosity, 0.01 poise, is

- [A.](#)0.2200 cm/sec
  - [B.](#)0.2225 cm/sec
  - [C.](#)0.2250 cm/sec
  - [D.](#)**0.2275 cm/sec**
  - [E.](#)0.2300 cm/sec
- 

30. The direct shear test suffers from the following disadvantage:

- [A.](#)Drain condition cannot be controlled
- [B.](#)Pore water pressure cannot be measured
- [C.](#)**Shear stress on the failure plane is not uniform.**
- [D.](#)The area under the shear and vertical loads does not remain constant throughout the test
- [E.](#)All the above.

31. For a clay slope of height of 10 m, the stability number is 0.05,  $\gamma = 2.0 \text{ t/m}^3$ ,  $C = 2.5 \text{ t/m}^2$ , the critical height of the slope of the soil, is

- [A.](#)4.0 m
  - [B.](#)12.5 m
  - [C.](#)**25.0 m**
  - [D.](#)15.0 m
- 

32. If  $\sigma_0'$  and  $\sigma'$  represent initial and increased pressure ;  $e_0$  and  $e$  void ratios corresponding to initial and increased pressure ; and  $C_c$  the compression index (dimensionless), then, the virgin compression curve as expressed by Terzaghi empirical formula is

- [A.](#) $e = e_0 + C_c \log_{10} \sigma'/\sigma_0'$
  - [B.](#) $e = e_0 - C_c \log_{10} \sigma'/\sigma_0'$
  - [C.](#) $e_0 = e - C_c \log_{10} \sigma'/\sigma_0'$
  - [D.](#) $e_0 = e + C_c \log_{10} \sigma'/\sigma_0'$
- 

33. The equation  $\tau = C + \sigma \tan \phi$  is given by

- [A.](#)Rankine
  - [B.](#)**Coulomb**
  - [C.](#)Culaman
  - [D.](#)Mohr.
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34. You are given a sample of soil containing coarse grains to determine its water content, you will use

- [A.](#)**pycnometer**
  - [B.](#)oven-drying method
  - [C.](#)calcium carbide method
  - [D.](#)alcohol method.
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35. Pick up the incorrect statement from the following:

- A. Compaction has no effect on the structure of a soil**
- B. Permeability decreases with increase in the dry density of a compacted soil
- C. A wet side compacted soil is more compressible than a dry side compacted soil
- D. Dry side compaction soils swell more when given access to moisture
- E. None of the these.

36. The maximum load carried by a pile, when it continues to sink without further increase of load, is known as

- A. ultimate load carrying capacity
- B. ultimate bearing capacity
- C. ultimate bearing resistant
- D. all the above.**

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37. The soil which contains finest grain particles, is

- A. coarse sand
- B. fine sand
- C. silt
- D. clay.**

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38. The general relationship between specific gravity ( $G$ ), weight of water ( $\gamma_w$ ), degree of saturation ( $S_r$ ), void ratio ( $e$ ) and bulk density ( $\gamma$ ), is

A. 
$$\gamma = \frac{(S - eS_r)\gamma_w}{1 + e}$$

B. 
$$\gamma = \frac{(G + eS_r)\gamma_w}{1 + e}$$

C. 
$$\gamma = \frac{(1 + e)\gamma_w}{G + S_r}$$

D. 
$$\gamma = \frac{(1 + S_r)e}{G + S_r}$$



39. If  $C$  is cohesion,  $F$  is factor of safety,  $\gamma$  is unit weight of soil and  $H$  is the maximum height of embankment, the stability number, is

A.  $\frac{F}{C\gamma H}$

**B.**  $\frac{C}{F\gamma H}$

C.  $\frac{H}{CF\gamma}$

D.  $\frac{\gamma}{CFH}$

E.  $\frac{CF}{\gamma H}$

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40. The angle between the directions of the failure and the major principal plane, is equal to

A.  $90^\circ$  + effective angle of shearing resistance

**B.**  $90^\circ$  + half of the angle of shearing resistance

C.  $45^\circ$  - half of the angle of shearing resistance

**D.**  $45^\circ$  + half of the angle of shearing resistance.

41. The compressibility of clays, is caused due to:

A. expulsion of double layer water from in between the grains

**B.** slipping of particles to new positions of greater density

C. bending of particles as elastic sheets

**D.** all the above.

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42. A phreatic line is defined as the line within a dam section below which there are

A. positive equipotential lines

**B.** positive hydrostatic pressure

C. negative hydrostatic pressure

D. negative equipotential lines

E. none of these.

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43. The ratio of the difference between the void ratio of the soil in its loosest state and its natural void ratio ( $e$ ) to the difference between the void ratios in the loosest and fully dense state, is generally termed as

A. degree of density

**B.** relativity

C. density index

**D.** all the above.

44. Pick up the correct statement from the following:

- A. The property of a soil that enables it to become stiff in a relatively short time on standing is called *thixotropy*
  - B. The ratio of shear strength in natural state to the remoulded shear strength under undrained conditions, is called *degree of sensitivity*.
  - C. The difference between the undisturbed shear strength and remoulded shear strength is known *remoulding loss*
  - D. The tendency of dense sand to expand on application of shearing load, is known as *dilatancy*
  - E. **All the above.**
- 

45. According to the Indian Standards the specific gravity is the ratio of the unit weight of soil solids to that of water at a temperature of

- A. 17°C
- B. 23°C
- C. 27°C
- D. 30°C

46. Pick up the correct statement from the following:

- A. Illite bond is weaker than Kaolinite bond
  - B. Illite bond is stronger than montmorillonite bond
  - C. Illites do not swell when wet
  - D. Illites are composed of two silica tetrahedralsheets with a central octahedral sheet
  - E. **All the above.**
- 

47. Determination of water content of a soil sample suspected to contain gypsum is made by drying the sample for longer period at a temperature not more than

- A. 60°C
  - B. 80°C
  - C. 100°C
  - D. 110°C
- 

48. Water formed transported soil is

- A. alluvial
  - B. marine
  - C. lacustrine
  - D. **loess.**
- 

49. A decrease in water content results in a reduction of the volume of a soil in

- A. liquid state
  - B. plastic state
  - C. semi solid state
  - D. **all of these.**
- 

50. Pick up the correct statement from the following:

- A. If the ratio of depth to width is less than 2, it is shallow foundation
- B. If the ratio of depth to width is more than 2, it is deep foundation
- C. If the ratio of the length to width is between 1 and 2, it is spread foundation
- D. If the length is large as compared to width, it is a strip foundation
- E. **All the above.**

1. The vane shear test is used for the in-situ determination of the undrained strength of the intact fully saturated

- [A.](#)sands
- [B.](#)clays**
- [C.](#)gravels
- [D.](#)highly organic soils.

---

2. Fundamental relationship between dry density ( $\gamma_d$ ), bulk density ( $\gamma$ ) and water content ( $\omega$ ), is :

[A.](#)  $\gamma = \frac{\gamma_d}{1 + \omega}$

**[B.](#)  $\gamma_d = \frac{\gamma}{1 + \omega}$**

[C.](#)  $\omega = \frac{\gamma}{1 + \gamma_d}$

[D.](#)  $\omega = \frac{\gamma}{1 - \gamma_d}$

---

3. The specific gravity of quartz, is

- [A.](#)2.65**
- [B.](#)2.72
- [C.](#)2.85
- [D.](#)2.90

---

4. If the cohesive force, ( $c$ ), is  $1.5 \text{ t/m}^2$ , the density ( $\gamma$ ) of the soil is  $2.0 \text{ t/m}^3$ , factor of safety ( $F$ ) is 1.5 and stability factor ( $S_n$ ) is 0.05, the safe height of the slope, is

- [A.](#)5 metres
- [B.](#)8 metres
- [C.](#)10 metres**
- [D.](#)12 metres

---

5. Pick up the correct statement from the following:

- [A.](#)The phenomenon of quicksand generally occurs in the cohesionless soil
- [B.](#)At critical hydraulic gradient, the saturated sand becomes quick
- [C.](#)The critical gradient depends on the void ratio and the specific gravity
- [D.](#)The quick sand occurs more in fine sand and silt than coarse material
- [E.](#)All the above.**

6. If  $W_1$ ,  $W_2$ ,  $W_3$  and  $W_4$  are the sequential weights obtained during observations in pycnometer method for determining water content, the formula to be used, is

A. 
$$W = \left[ \left( \frac{W_2 + W_1}{W_3 + W_4} \right) \left( \frac{G - 1}{G} \right) - 1 \right] \times 100$$

B. 
$$W = \left[ \left( \frac{W_3 + W_1}{W_3 + W_4} \right) \left( \frac{G - 1}{G} \right) + 1 \right] \times 100$$

C. 
$$W = \left[ \left( \frac{W_2 - W_1}{W_3 - W_4} \right) \left( \frac{G - 1}{G} \right) - 1 \right] \times 100$$

D. 
$$W = \left[ \left( \frac{W_2 - W_1}{W_3 - W_4} \right) \left( \frac{G + 1}{G} \right) - 1 \right] \times 100$$

---

7. Si particles

A. show dilatancy

B. swell when moist

C. possess high strength when dry

D. disintegrate easily.

---

8. Flow net is used for the determination of

A. quantity of seepage

B. hydrostatic pressure

C. seepage pressure

D. exit gradient

E. all the above.

---

9. If the back fill is having a uniform surcharge of intensity  $q$  per unit area, the lateral pressure will be

A.  $q$  times the lateral pressure within the surface

B.  $1/q$  times the lateral pressure within the surface

C. equal to a fill of height  $Z$  equal to  $q/r$ , where  $r$  is the density of the backfill

D. none of these.

---

10. Pick up the correct statement from the following:

A. Isotropic consolidation of clay can be obtained in the triaxial apparatus under equal all-round pressure.

B. If the present effective stress is the maximum to which the clay has ever been subjected, it is called normally consolidated clay

C. If the present effective stress in the past was more than present effective stress, it is called over-consolidated clay

D. All the above.

11. Through a point in a loaded soil, the principal stress is maximum on  
A. minor principal plane  
B. intermediate principal plane  
**C. major principal plane**  
D. none of these.
- 

12. Maximum size of clay particles, is :  
**A. 0.002 mm**  
B. 0.04 mm  
C. 0.06 mm  
D. 0.08 mm  
E. 1 mm
- 

13. The capillary rise of water  
**A. depends upon the force responsible**  
B. increases as the size of the soil particles increases  
C. decreases as the size of the soil particles decreases  
D. is less in wet soil than in dry soil.
- 

14. Coulomb's wedge theory assumes that  
A. back fill is dry, cohesionless, homogeneous and isotropic  
B. slip surface is the plane which passes through the heel of the wall  
C. sliding wedge itself acts as a rigid body and the value of earth pressure is obtained by considering the limiting equilibrium of the wedge  
D. position and direction of the resultant earth pressure, are known  
**E. all the above.**
- 

15. If dry density, water density and specific gravity of solids of a given soil sample are 1.6 g/cc, 1.84 g/cc and 2.56 respectively, the porosity of the soil sample, is  
**A. 0.375** B. 0.370  
C. 0.380 D. 0.390
- 

16. Pick up the correct statement applicable to plate load test  
A. Width of the test pit for plate load test is made five times the width of the plate  
B. At the centre of the test pit, a hole is dug out whose size is kept equal to the size of the test plate  
C. Bottom level of the hole dug at the centre of the test pit, is kept at the level of the actual formation  
D. Ratio of the depth of the hole to the width of the test plate is the same as the ratio of the depth of the actual formation to the width of the formation  
**E. All the above.**
-

17. Terzaghi's analysis assumes :

- A. soil is homogeneous and isotropic
- B. elastic zone has straight boundaries inclined at  $\psi = \phi$  to the horizontal and plastic zones fully developed
- C. failure zones do not extend above the horizontal plane through the base of the footing
- D. all the above.**

---

18. The fundamental equation of air content ( $a_c$ ), degree of saturation ( $S_r$ ) and void ratio ( $e$ ), is

A.  $a_c = \frac{e(1 - S_r)}{1 - e}$

B.  $a_c = \frac{e(1 + S_r)}{1 + e}$

C.  $a_c = \frac{e(1 - S_r)}{1 + e}$

D.  $a_c = \frac{e(1 - S_r)}{1 + e}$

---

19. A soil sample has passing 0.075 mm sieve = 60% liquid limit = 65% and plastic limit = 40%.  
The group index of the soil, is

- A. 5
- B. 20
- C. 40
- D. none of these.**

---

20. The plasticity index is the numerical difference between

- A. liquid limit and plastic limit**
- B. plastic limit and shrinkage limit
- C. liquid limit and shrinkage limit
- D. none of these.

21. The fundamental equation of specific gravity ( $G$ ), dry density ( $\gamma_d$ ), unit weight of water ( $\gamma_w$ ) and void ratio ( $e$ ), is

A.  $e = \frac{G \gamma_w}{1 + \gamma_d}$

B.  $G = \frac{\gamma_d \cdot \gamma_w}{1 + e}$

C.  $\gamma_d = \frac{G \cdot \gamma_w}{1 + e}$

D.  $\gamma_w = \frac{G \cdot \gamma_d}{1 + e}$

22. Negative skin friction on piles

- A. is caused due to relative settlement of the soil
  - B. is caused in soft clays
  - C. decreases the pile capacity
  - D. all of the above.**
- 

23. Fine sand possesses

- A. good plasticity
  - B. limited plasticity
  - C. reasonable plasticity
  - D. clay.**
- 

24. The ultimate bearing capacity of a soil, is

- A. total load on the bearing area
  - B. safe load on the bearing area
  - C. load at which soil fails**
  - D. load at which soil consolidates.
- 

25. Transporting and redepositing soils, is done by

- A. water
  - B. glacier
  - C. gravity
  - D. wind
  - E. all the above.**
- 

26. A moist soil sample of volume 60 cc. weighs 108 g and its dried weight is 86.4 g. If its absolute density is 2.52, the degree of saturation is

- A. 54%
  - B. 64%
  - C. 74%
  - D. 84%**
- 

27. Pick up the correct statement from the following:

- A. O.M.C. refers to the moisture corresponding to the maximum point on the moisture content dry density curve
  - B. The line which shows moisture content dry density relation for soil containing a constant percentage of air voids, is known as air void line
  - C. The weight of hammer used for compaction test is 25 kg
  - D. The free fall of hammer for compaction is 30.5 cm
  - E. All the above.**
- 

28. The passive earth pressure of a soil, is proportional to (where  $\phi$  is the angle of internal friction of the soil.)

- A.  $\tan(45^\circ - \phi)$
  - B.  $\tan(45^\circ + \phi)$
  - C.  $\tan^2(45^\circ - \phi)$
  - D.  $\tan^2(45^\circ + \phi)$**
-

29. If a soil undergoes a change in shape and volume by application of external loads over it, but recovers its shape and volume immediately after removal of the load, the property of the soil is said to be

- [A.](#) Resilience of soils
- [B.](#) Elasticity of soils**
- [C.](#) Compressibility of soils
- [D.](#) None of these.

---

30. If the unit weight of sand particles is 2.696 g/cc. and porosity in loose state is 44%, the critical hydraulic gradient for quick sand condition, is

- [A.](#) 0.91
- [B.](#) 0.92
- [C.](#) 0.93
- [D.](#) 0.94
- [E.](#) 0.95**

31. The void ratio of a soil sample decreases from 1.50 to 1.25 when the pressure is increased from 25 tonnes/m<sup>2</sup> to 50 tonnes/m<sup>2</sup>, the coefficient of compressibility is

- [A.](#) 0.01**
- [B.](#) 0.02
- [C.](#) 0.05
- [D.](#) 0.001

---

32. Pick up the incorrect statement from the following:

- [A.](#) The smaller the size of the pores, the higher the water can rise above the water table.
- [B.](#) Below the water table, the pore water may be static.
- [C.](#) The hydrostatic pressure depends on the depth below the water level.
- [D.](#) The attractive forces between the particles, caused due to negative pressure of water held above the water table is called soil suction.
- [E.](#) None of these.**

---

33. The maximum water content at which a reduction in water content does not cause a decrease in volume of a soil mass, is known

- [A.](#) liquid limit
- [B.](#) plastic limit
- [C.](#) shrinkage limit**
- [D.](#) permeability limit.

---

34. A sample of saturated soil has 30% water content and the specific gravity of soil grains is 2.6. The dry density of the soil mass in g/cm<sup>3</sup>, is

- [A.](#) 1.47
- [B.](#) 1.82
- [C.](#) 1.91
- [D.](#) none of these.**

---

35. The specific gravity of sands, is approximately

- [A.](#) 1.6
- [B.](#) 2.0
- [C.](#) 2.2
- [D.](#) 2.4
- [E.](#) 2.6**



36. If the coefficients of volume change and compressibility of a soil sample are respectively  $6.75 \times 10^{-2}$  and  $3 \times 10^{-2}$ , the void ratio of the soil sample, is

- A. 1.10 B. 1.15  
C. 1.20 **D. 1.25**  
E. 1.30
- 

37. The minimum centre to centre distance of friction piles of 1 m diameter, is

- A. 2 m  
B. 2 m to 3 m  
**C. 3 m to 4 m**  
D. 5 m
- 

38. Over-consolidation of soils is caused due to

- A. erosion of over burden  
B. melting of ice sheets after glaciation  
C. permanent rise of water table  
**D. all the above.**
- 

39. Darcy's law is applicable to seepage if a soil is

- A. homogeneous  
B. isotropic  
C. incompressible  
**D. all the above.**
- 

40. An infinite slope is inclined at angle  $i$  and has its angle of internal friction  $\phi$ , the stability number  $S_a$ , is

- A.  $\frac{\cos^2 i}{\tan i - \tan \phi}$   
B.  $\frac{\sin^2 i}{\tan i - \tan \phi}$   
**C.  $(\tan i - \tan \phi) \cos^2 i$**   
D.  $(\tan i - \tan \phi) \sin^2 i$
- 

41. Depending upon the properties of a material, the failure envelope may

- A. be either straight or curved  
B. pass through the origin of stress  
C. intersect the shear stress axis  
**D. all the above.**
-

42. A stratum of clay 2 m thick will get consolidated 80% in 10 years. For the 80% consolidation of 8 m thick stratum of the same clay, the time required is

- [A.](#) 100 years
  - [B.](#) 120 years
  - [C.](#) 140 years
  - [D.](#) 160 years**
  - [E.](#) 180 years.
- 

43. The maximum net pressure intensity causing shear failure of soil, is known

- [A.](#) safe bearing capacity
  - [B.](#) net safe bearing capacity
  - [C.](#) net ultimate bearing capacity**
  - [D.](#) ultimate bearing capacity.
- 

44. The factor which affects the compaction, is

- [A.](#) moisture content
  - [B.](#) compacting content
  - [C.](#) method of compaction
  - [D.](#) type of soil
  - [E.](#) All the above.**
- 

45. The compression resulting from a long term static load and consequent escape of pore water, is known as

- [A.](#) compaction
  - [B.](#) consolidation**
  - [C.](#) swelling
  - [D.](#) none of these.
- 

46. Soil classification of composite soils, exclusively based on the particle size distribution, is known

- [A.](#) particle classification
  - [B.](#) textural classification**
  - [C.](#) High Way Research Board classification
  - [D.](#) unified soil classification.
- 

47. The coefficient of curvature for a well graded soil, must be between

- [A.](#) 0.5 to 1.0
  - [B.](#) 1.0 to 3.0**
  - [C.](#) 3.0 to 4.0
  - [D.](#) 4.0 to 5.0
-

48. Fundamental relationship between dry density ( $\gamma_d$ ), specific gravity ( $G$ ), water content ( $\omega$ ) and percentage of air voids ( $n_a$ ) is :

A. 
$$\gamma_d = \frac{(1 - n_a)G \gamma_w}{1 + \omega G}$$

B. 
$$\gamma_d = \frac{(1 + n_a)G \gamma_w}{1 + \omega G}$$

C. 
$$\gamma_d = \frac{(1 + n_a)G \gamma_w}{1 - \omega G}$$

D. 
$$\gamma_d = \frac{(1 - n_a)G \gamma_w}{1 - \omega G}$$

---

49. A moist soil sample weighing 108 g has a volume of 60 cc. If water content is 25% and value of  $G = 2.52$ , the void ratio is

A.0.55

B.0.65

C.**0.75**

D.0.80

---

50. The shear resistance of a soil is constituted basically of the following component.

A. The frictional resistance to translocation between the individual soil particles at their contact point

B. To the structural relation to displacement of the soil because of the interlocking of the particles

C. Cohesion and adhesion between the surfaces of the soil particles

D.**All the above.**

1. The method of the slices is applicable to

A.**homogenous soils**

B.stratified soils

C.saturated soils

D.non-uniform slopes

E. all the above.

---

2. When the seepage pressure becomes equal to the pressure due to submerged weight of a soil, the effective pressure is reduced to zero and the soil particles have a tendency to move up in the direction of flow. This phenomenon is generally known

A.quick condition

B.boiling condition

C.quick sand

D.**all the above.**

3. The phreatic line in an earth dam may be

- [A.circular](#)
  - [B.elliptical](#)
  - [C.parabolic](#)**
  - [D.a straight line](#)
  - [E.all the above.](#)
- 

4. Pick up the correct statement from the following:

- [A.A maximum value of dry density is obtained at optimum water content](#)
  - [B.At low value of water content most soils tend to be stiff.](#)
  - [C.At high water content, the dry density decreases with an increase of water content.](#)
  - [D.An airless soil will have maximum possible value of dry density for the given water content](#)
  - [E.All the above.](#)**
- 

5. The shearing strength of a cohesion-less soil depends upon

- [A.dry density](#)
  - [B.rate of loading](#)
  - [C.confining pressure](#)**
  - [D.nature of loading.](#)
- 

6. According to IS : 2720 - 1965, the composition of a dispersing solution used in pipette analysis for determining the size of particles, is

- [A.sodium-hexametaphosphate 33 g, sodium carbonate 7 g and distilled water one litre](#)**
  - [B.sodium-hexametaphosphate 7 g, sodium carbonate 33 g and distilled water one litre](#)
  - [C.sodium-hexametaphosphate 23 g, sodium carbonate 17 g and distilled water one litre](#)
  - [D.none of these.](#)
- 

7. Cohesive soils are generally

- [A.plastic and also compressible](#)**
  - [B.elastic and also compressible](#)
  - [C.plastic but incompressible](#)
  - [D.none of these.](#)
- 

8. If the coefficient of the active pressure  $K_a$  is  $1/3$ , the coefficient of passive pressure  $K_p$ , is

- [A.1/3](#)
  - [B.2/3](#)
  - [C.1](#)
  - [D.3/2](#)
  - [E.3](#)**
- 

9. The inventor of the term soil mechanics, was

- [A.Kray](#)
  - [B.Dr. Karl Terzaghi](#)**
  - [C.Leygue](#)
  - [D.Fellenius.](#)
-

10. Compression of soil occurs rapidly if voids are filled with  
**A.air**  
B.water  
C.partly with air and partly with water  
D.none of these.
11. If drainage is permitted throughout the test, during the application of both normal, and shear stresses so that full consolidation occurs and no excess pore pressure is set up at any stage of the test, is known as  
A.quick test  
**B.drained test**  
C.consolidated undrained test  
D.none of these.
- 
12. The degree of saturation of the soil sample stated in Q. No. 213, is  
A.95.4% B.95.5%  
C.95.6% **D.95.7%**
- 
13. For slopes of limited extent the surface of slippage, is usually along  
A.a parabolic arc  
B.an elliptical arc  
C.a straight line  
**D.a circular arc.**
- 
14. For a base failure of a slope, depth factor  
A.Df = 1  
B.Df < 1  
**C.Df > 1**  
D.none of these.
- 
15. A critical hydraulic gradient may occur when  
A.flow is in upward direction  
B.seepage pressure is in upward direction  
C.effective pressure is zero  
**D.all the above.**
16. Plasticity index is defined as the range of water content between  
**A.liquid and plastic limit**  
B.plastic limit and semi solid limit  
C.semi-solid limit and liquid limit  
D.liquid limit and solid limit.
-

17. The minimum depth of building foundations on

- [A.](#) sandy soils is 80 cm to 100 cm
- [B.](#) clay soils is 90 cm to 160 cm
- [C.](#) rocky soils is 5 cm to 50 cm
- [D.](#) **all the above.**

---

18. The ratio of the undrained strength in the undrained state to the undrained strength, at the same water content, in the remoulded state, is called the sensitivity of the clay. Its value for quick clays is

- [A.](#) 4
- [B.](#) 8
- [C.](#) 12
- [D.](#) 16
- [E.](#) **20**

---

19. The total weight of a pycnometer with water and oven dried soil 20 (g) is 1600 g. The pycnometer filled with water alone weighs 1500 g. The specific gravity of the soil, is

- [A.](#) 1.0
- [B.](#) 1.5
- [C.](#) **2.0**
- [D.](#) 2.5

---

20. The consolidation time for soils

- [A.](#) increases with increasing compressibility
- [B.](#) decreases with increasing permeability
- [C.](#) increases rapidly with increasing size of soil mass
- [D.](#) is independent of the magnitude of the stress change.
- [E.](#) **All the above.**

21. The zero atmospheric pressure is at

- [A.](#) sea level
- [B.](#) mean sea level
- [C.](#) water table
- [D.](#) phreatic surface
- [E.](#) **both (c) and (d) of the above.**

---

22. A soil mass coated with a thin layer of paraffin weighs 460 g. When immersed, it displaces 299 cc of water. The weight of paraffin is 10 g. If specific gravity of solids is 2.5 and that of paraffin 0.9, the void ratio of soil, is

- [A.](#) 0.55
  - [B.](#) **0.60**
  - [C.](#) 0.65
  - [D.](#) 0.70
-

23. Pick up the incorrect definition from the following:

- A. Ratio of the compressive strength of unconfined undisturbed soil to that of remoulded soil, is known as the sensitivity of the soil sample
  - B. The rotation of soil particles into stable state while remoulding, is known as the thiotropy of soil
  - C. The water content at which a soil changes from the liquid state to solid state, is known liquid limit of the soil
  - D. The water content at which a soil flows, is known plastic limit of the soil**
  - E. None of these.
- 

24. In a flow net

- A. flow lines and equipotential lines cross each other at right angles**
  - B. fields are rectangles whose length is twice the breadth
  - C. smaller the dimensions of the field, smaller will be the hydraulic gradient and velocity of flow through it
  - D. for homogeneous soil, the curves are smooth and circular.
- 

25. The ratio of the volume of water present in a given soil mass to the total volume of its voids, is known

- A. porosity
- B. void ratio
- C. percentage voids
- D. degree of saturation.**

26. Stoke's law does not hold good if the size of particle is smaller than

- A. 0.0002 mm**
  - B. 0.002 mm
  - C. 0.02 mm
  - D. 0.2 mm
- 

27. In a purely cohesive soil, the critical centre lies at the intersection of

- A. perpendicular bisector of slope and the locus of the centre
  - B. perpendicular drawn at 1/3rd slope from toe and the locus of the centre
  - C. perpendicular drawn at 2/3rd slope from toe and the locus of the centre
  - D. directional angles**
  - E. none of these.
- 

28. The angle of internal friction, is least for

- A. angular-grained loose sand
  - B. angular -grained dense sand
  - C. round-grained loose sand
  - D. round-grained loose sand
  - E. clays.**
-

29. In non-cohesive soil in passive state of plastic equilibrium

A.major principal stress is horizontal

B.minor principal stress is vertical

**C.major principal stress is vertical**

D.minor and major principal stresses are equally inclined to the horizontal.

---

30. In active state of plastic equilibrium in a non cohesive soil with horizontal ground surface

A.major principal stress is horizontal

B.minor principal stress is vertical

**C.major principal stress is vertical**

D.minor and major principal stresses are equally inclined to horizontal.

---

31. The reduction in volume of soil due to squeezing out of water from the voids, is termed

A.primary consolidation

B.primary compression

C.primary time effect

**D.all the above.**

---

32. 'Drift' is the material picked up, mixed, disintegrated, transported and redeposited by

A.wind

B.gravitational force

**C.glaciated water**

D.all the above.

---

33. The consistency index of a soil is defined as the ratio of

A.liquid limit plus the natural water content to the plasticity index of the soil

**B.liquid limit minus the natural water content to the plasticity index of the soil**

C.natural water content of a soil minus plastic limit to the plasticity index of the soil

D.natural water content of a soil plus its plastic limit to the plasticity index of the soil.

---

34. The weight of a container is  $W_1$  and that of container with soil sample, is  $W_2$ . If the weight of the container and oven dried soil sample is  $W_3$ , the moisture content of the soil, is

A.  $\frac{W_2 - W_3}{W_3 - W_1} \times 100$

B.  $\frac{W_3 - W_2}{W_1 - W_2} \times 100$

C.  $\frac{W_1 - W_2}{W_2 - W_3} \times 100$

D.  $\frac{W_2 - W_1}{W_1 - W_3} \times 100$

---



35. The shear strength in plastic undrained clay, is due to

- A.inter-granular friction
- B.internal friction
- C.cohesion**
- D.none of these.

36. The Terzaghi's general bearing capacity equation for a continuous footing is given by (where  $N_c$ ,  $2V$  &  $N_\gamma$  are bearing capacity factors.)

- A.**  $qf = cN_c + \gamma DN_q + 0.5\gamma BN_\gamma$
- B.  $qf = cN_c - \gamma DN_q + 0.5\gamma BN_\gamma$
- C.  $qf = cN_c + \gamma DN_q - 0.5\gamma BN_\gamma$
- D.  $qf = cN_c - \gamma DN_q - 0.5\gamma BN_\gamma$

---

37. A clay subjected to pressure in excess to its present over-burden, is said to be

- A.pre-compressed
- B.pre-consolidated
- C.over-consolidated
- D.all the above.**

---

38.

The expression  $\frac{G_s}{1 + \omega G_s} \rho_w$  is used for

- A.dry density**
- B.bulk density
- C.degree of saturation
- D.optimum water content.

---

39. If  $C_v$  is the coefficient of consolidation,  $t$  is the time and  $d$  is drainage path of one dimensional consolidation of soil, the time factor  $T_v$ , is given by

- A.  $T_v = \frac{d^2}{C_v t}$
- B.  $T_v = \frac{t^2}{d^2 C_v}$
- C.  $T_v = \frac{C_v^3}{d^2 t}$
- D.**  $T_v = \frac{C_v t}{d^2}$

---

40. The total active earth pressure due to dry back fill with no surcharge, acts at  $H/3$  above the base of the wall and is directly proportional to

- A. $H$
- B. $\sqrt{H}$
- C. $H^2$**
- D. $H^3$ .

41. If  $e_0$ ,  $e$ ,  $\sigma'$ ,  $\sigma_0'$  have their usual meanings, the coefficient of compressibility ( $a_c$ ), is given by

A.  $a_c = \frac{e - e_0}{e' + e_0'}$

B.  $a_c = \frac{e_0 - e}{\sigma' - \sigma_0'}$

C.  $a_c = \frac{\sigma' - \sigma_0'}{e_0 - e}$

D.  $a_c = \frac{\sigma_0' - \sigma'}{e - e_0}$

---

42. A saturated soil sample has water content of 40% and specific gravity of soil particles 2.7. The void ratio of the soil, is

A. 0.4

**B. 0.52**

C. 1.08

D. none of these.

---

43. For testing a saturated clay for shear strength, the test recommended, is

A. direct shear test

B. triaxial compression test

**C. unconfined compression test**

D. all the above.

---

44. The critical exist gradient of seepage water in soils, increases with

A. an increase in specific gravity

B. a decrease in specific gravity

C. a decrease in void ratio

**D. both (a) and (c)**

E. none of these.

---

45. The coefficient  $k_a$  of the active earth pressure, is given by

A.  $k_a = \frac{1 - \tan \phi}{1 + \tan \phi}$

B.  $k_a = \frac{1 + \tan \phi}{1 - \tan \phi}$

C.  $k_a = \frac{1 + \sin \phi}{1 - \sin \phi}$

**D.  $k_a = \frac{1 - \sin \phi}{1 + \sin \phi}$**

46. Pick up the correct statement from the following:

- [A.](#)The void ratio in soils is defined as the ratio of the volume of voids to the volume of solids
  - [B.](#)The porosity of a soil is defined as the ratio of the volume of voids to the gross volume of the soil
  - [C.](#)The bulk density of a soil is defined as the unit weight of the soil
  - [D.](#)The dry density of a soil is defined as weight of solids to the total volume of the soil
  - [E.](#)**All the above.**
- 

47. The shear strength of a soil

- [A.](#)increases with an increase in the normal stress
  - [B.](#)is proportional to the cohesion of the soil
  - [C.](#)is generally known as the strength of the soil
  - [D.](#)is proportional to the tangent of the angle of internal friction
  - [E.](#)**all the above.**
- 

48. The property of a soil which permits water to percolate through it, is called

- [A.](#)moisture content
  - [B.](#)**permeability**
  - [C.](#)capillarity
  - [D.](#)none of these.
- 

49. The triaxial apparatus is usually used for

- [A.](#)unconsolidated-undrained test
  - [B.](#)consolidated-undrained test
  - [C.](#)drained test
  - [D.](#)**all the above tests.**
- 

50. A pycnometer is used to determine

- [A.](#)voids ratio
  - [B.](#)dry density
  - [C.](#)**water content**
  - [D.](#)density index.
- 

1. Soils containing organic matters

- [A.](#)**are of spongy nature**
  - [B.](#)swell with decrease of moisture
  - [C.](#)shrink with increase of moisture content
  - [D.](#)none of these.
- 

2. A soil not fully consolidated under the existing over-burden pressure, is called

- [A.](#)pre-consolidated
  - [B.](#)normally consolidated
  - [C.](#)**over-consolidated**
  - [D.](#)none of these.
-

3. The angle of internal friction is maximum for

- A. angular-grained loose sand
- B. angular-grained dense sand**
- C. round-grained dense sand
- D. round-grained loose sand
- E. clays.

---

4. If  $G$  is specific gravity of sand particles,  $e$  is porosity, the critically hydraulic gradient

A.  $i_c =$

B.  $i_c = \frac{G + 1}{1 + e}$

C.  $i_c = \frac{G - 1}{1 + e}$

D.  $i_c = \frac{G - 1}{1 - e}$

---

5. A grillage foundation

- A. is provided for heavily loaded isolated columns
- B. is treated as spread foundation
- C. consists of two sets of perpendicularly placed steel beams
- D. all the above.**

6. The plasticity of fine soils may be assessed by means of

- A. dry strength test
- B. toughness test
- C. dilatancy test
- D. all of these.**

---

7. The density of soil can be increased

- A. by reducing the space occupied by air
- B. by elastic compression of soil grains
- C. by expelling water from pores
- D. All the above.**

---

8. The degree of saturation of the soil sample stated in Question No. 11.243, is

- A. 54%
- B. 64%
- C. 74%
- D. 84%**

---

9. The length/diameter ratio of cylindrical specimens used in triaxial test, is generally

- A. 1
- B. 1.5
- C. 2**
- D. 2.5
- E. 3

10. Pick up the correct statement from the following:

- A. The object of classifying soils is to arrange them into groups according to their properties and behaviour
- B. A soil classification system is meant to provide an accepted and systematic method of describing the various types of soils eliminating personal factors
- C. The first category of soil classification is based on grain size of the soil
- D. The second category of soil classification is based on fine as well as coarse grains
- E. All the above.

11. The porosity of the soil sample stated in Q. No. 213, is

- A. 44.3%
- B. 45.3%
- C. 46.3%
- D. 47.3%

---

12. A suspended particle falls through a height  $H$  cm in water in  $t$  minutes. If the viscosity of water is  $\eta$  and specific gravity of the particle is  $G$ , the diameter of the particle is (where  $M$  is a constant factor)

- A.  $10^3 M \sqrt{\frac{H}{t}}$
- B.  $10^4 M \sqrt{\frac{H}{t}}$
- C.  $10^5 M \sqrt{\frac{H}{t}}$
- D.  $10^2 M \sqrt{\frac{H}{t}}$

---

13. Laplacian fundamental equation for a non-compressible flow in three dimensions, is

- A.  $\frac{\delta u}{\delta x} + \frac{\delta v}{\delta y} + \frac{\delta w}{\delta z} = 0$
- B.  $\frac{\delta^2 h}{\delta x^2} + \frac{\delta^2 h}{\delta y^2} + \frac{\delta^2 h}{\delta z^2} = 0$
- C.  $\frac{\delta^2 \phi}{\delta x^2} + \frac{\delta^2 \phi}{\delta y^2} + \frac{\delta^2 \phi}{\delta z^2} = \Phi$
- D. none of these.

---

14. The bearing capacity of a soil depends upon

- A. size of the particles
  - B. shape of the particles
  - C. cohesive properties of particles
  - D. internal frictional resistance of particles
  - E. all the above.
-

15. A direct shear test possesses the following disadvantage:  
A.A relatively thin thickness of sample permits quick drainage  
B. A relatively thin thickness of sample permits quick dissipation of pore pressure developed during the test  
C.**As the test progresses the area under shear, gradually changes**  
D.none of these.
16. Through a point in a loaded soil mass, there exists  $n$  typical planes mutually orthogonal on which the stress is wholly normal and no shear stress acts, if  $n$  is  
A.1  
C.**3**  
B.2  
D.4
- 
17. The pressure that builds up in pore water due to load increment on the soil, is termed  
A.excess pore pressure  
B.excess hydrostatic pressure  
C.hydrodynamic pressure  
D.**all the above.**
- 
18. The ratio of  $e_{max}$  and  $e_{min}$  of silty sand, is  
A.2.0  
C.**3.0**  
E.4.0  
B.5  
D.3.5
- 
19. A flow net may be utilised for the determination of  
A.exit gradient  
B.seepage  
C.hydrostatic pressure  
D.seepage pressure  
E.**all the above.**
- 
20. The neutral stress in a soil mass is  
A.force per neutral area  
B.force per effective area  
C.**stress taken up by the pore water**  
D.stress taken up by solid particles.
21. If voids ratio is 0.67, water content is 0.188 and specific gravity is 2.68, the degree of saturation of the soil, is  
A.25%  
C.60%  
B.40%  
D.**75%**
- 
22. If water content of a soil is 40%,  $G$  is 2.270 and void ratio is 1.35, the degree of saturation is  
A.70%  
C.**80%**  
E.90%  
B.75%  
D.85%

---

23. If  $\beta$  is the surcharge angle of a backfill with an angle of internal friction  $\phi$ , the coefficient of active earth pressure given by Rankine's theory, is :

A.  $K_a = \sin \beta \frac{\sin \beta - \sqrt{\sin^2 \beta - \sin^2 \phi}}{\sin \beta + \sqrt{\sin^2 \beta - \sin^2 \phi}}$

B.  $K_a = \cos \beta \frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi}}$

C.  $K_a = \tan \beta \frac{\tan \beta - \sqrt{\tan^2 \beta - \tan^2 \phi}}{\tan \beta + \sqrt{\tan^2 \beta - \tan^2 \phi}}$

D. none of these.

---

24. A structure is erected on an impervious clay whose thickness is 12 m. Drainage is possible both at upper and lower surfaces. Coefficient of consolidation is  $0.015 \text{ cm}^2$  per minute. For attaining 50% consolidation with a time factor 0.20, the number of days required

A. 3233

B. 3123

C. 33331

D. 3313

---

25. Which one of the following statements is true for Mohr-Coulomb envelope ?

A. Coulomb suggests that the relationship between shear strength and normal stress, is adequately represented by the straight line

B. The generalised Mohr theory suggests that, though the shear stress depends on the normal stress, the relation is not linear

C. Coulomb and Mohr suggest that a definite relationship exists among the principal stress and the angle of internal friction

D. For an ideal pure friction material, the straight line passes through the origin.

E. All the above.

---

26. The intensity of active earth pressure at a depth of 10 metres in dry cohesionless sand with an angle of internal friction of  $30^\circ$  and with a weight of  $1.8 \text{ t/m}^3$ , is

A.  $4 \text{ t/m}^2$

B.  $5 \text{ t/m}^2$

C.  $6 \text{ t/m}^2$

D.  $7 \text{ t/m}^2$

E.  $8 \text{ t/m}^2$

---

27. On wetting, cohesive soils,

A. loose permeability

B. gain shear strength

C. loose elasticity

D. decrease their shear strength.

28. Pick up the correct statement from the following:

- A. The range of water content between the liquid limit and plastic limit, is called *plasticity index*.
  - B. The ratio of the liquid limit minus the natural water content to the plasticity index of soils, is called *consistency index*
  - C. The ratio of natural water content minus its plastic limit to its plasticity index is called *liquidity index*
  - D. The ratio between plasticity index and flow index (*i.e.* slope of flow curve in case of liquid limit), is called *toughness index*
  - E. All the above.**
- 

29. 'Talus' is the soil transported by

- A. wind
  - B. water
  - C. glacier
  - D. gravitational force.**
- 

30. A triaxial shear test is preferred to direct shear test, because

- A. it can be performed under all three drainage conditions with complete control**
  - B. precise measurement of pore pressure and change in volume during test, is not possible
  - C. stress distribution on the failure plane, is non uniform
  - D. none of these.
- 

31. Pick up the correct statement from the following:

- A. When stress decreases, void ratio decreases
  - B. When stress decreases, coefficient of permeability decreases
  - C. When stress decreases, coefficient of volume change decreases
  - D. When stress decreases void ratio, coefficients of permeability and volume change decrease.**
- 

32. Chemical weathering of soil is caused due to

- A. oxidation
  - B. carbonation
  - C. hydration
  - D. leaching
  - E. all the above.**
- 

33. The Mohr's straight theory is based on the following fact :

- A. Material fails essentially by shear
  - B. Ultimate strength of the material is determined by the stress in the plane of slip
  - C. Failure criterion is independent of the intermediate principal stress
  - D. All the above.**
-



34. Hydrometer readings are corrected for:

- A.temperature correction
  - B.meniscus correction
  - C.dispersing agent correction
  - D.meniscus and dispersing agent corrections
  - E.temperature, meniscus and dispersing agent corrections.**
- 

35. Tergazhi's theory of one dimensional consolidation assumes

- A.soil is homogeneous and fully saturated
  - B.water and soil particles are incompressible
  - C.deformation of the soil, is entirely due to change in volume
  - D.Darcey's law for the velocity of flow of water through soil, is perfectly valid
  - E.all the above.**
- 

36. An unsaturated  $100 \text{ cm}^3$  sample of soil weighs 190 g. If its dried weight is 160 g, water content of the soil, is

- A.0.188**
  - B.0.288
  - C.0.388
  - D.0.488
  - E.0.588
- 

37. If the natural moisture content, the liquid limit and plastic limit of a soil sample are stated as 30.5%, 42.5% and 22.5% respectively, the ratio of liquidity index and plastic index, is

- A.  $\frac{1}{3}$
  - B.  $\frac{1}{2}$
  - C.2**
  - D.  $2\frac{1}{2}$
- 

38. The specific gravity of Calcite is

- A.2.65
  - B.2.72**
  - C.2.85
  - D.2.90
- 

39. The ratio of volume of air voids to the volume of total voids, is known as

- A.air content**
  - B.percentage air voids
  - C.percentage voids
  - D.porosity.
- 

40. A plane inclined at an angle  $\phi$  to the horizontal at which the soil is expected to stay in the absence of any lateral support, is known as

- A.natural slope line
- B.repose line
- C.the  $\phi$  line
- D.all the above.**

41. Tergazhi's theory of one dimensional consolidation assumes

- [A.](#)load is applied in one direction
  - [B.](#)coefficient of permeability is constant
  - [C.](#)excess pore water drains out only in the vertical direction
  - [D.](#)time lag in consolidation is due entirely to permeability
  - [E.](#)**all the above.**
- 

42. Pick up the correct statement from the following:

- [A.](#)The dry density reduces by addition of water after attaining optimum moisture content
  - [B.](#)The line joining the peak of three moisture content graphs obtained by using three compactive energies, is called line of optimum
  - [C.](#)Well graded coarse grained soils can be compacted to a very high density as compared to fine grained soils
  - [D.](#)**All the above. .**
- 

43. A soil mass is said to be in plastic equilibrium if

- [A.](#)it is stressed to maximum
  - [B.](#)**it is on the verge of failure**
  - [C.](#)it is in plastic stage
  - [D.](#)it starts flowing.
- 

44. Pick up the correct statement from the following:

- [A.](#)The permeability of the coarse-grained soils may be reduced by grouting.
  - [B.](#)The process of injecting fluids (*i.e.* grouts) into the pores space of the soil, is called grouting.
  - [C.](#)The grouting increases the soil strength.
  - [D.](#)**All the above.**
- 

45. A soil sample of mass specific gravity 1.92, has a moisture content 30%. If the specific gravity of solids is 2.75, the void ratio, is

- [A.](#)0.858
  - [B.](#)0.860
  - [C.](#)**0.862**
  - [D.](#)0.864
- 

46. The ratio of the weight of water to the weight of solids in a given mass of soil, is known

- [A.](#)porosity
  - [B.](#)**specific gravity**
  - [C.](#)void ratio
  - [D.](#)water content.
- 

47. During seepage through a soil, direction of seepage is always

- [A.](#)parallel to equipotential lines
  - [B.](#)perpendicular to stream lines
  - [C.](#)**perpendicular to equipotential lines**
  - [D.](#)none of these.
-

48. The slip at critical angle, is generally known

- [A.](#)  $\delta$  1-line
- [B.](#) rupture plane
- [C.](#) slip plane
- [D.](#) **all the above.**

---

49. The property of a soil which allows it to be deformed rapidly without rupture, elastic rebound and also a volume change, is known

- [A.](#) porosity
- [B.](#) **plasticity**
- [C.](#) permeability
- [D.](#) ductility.

---

50. According to Rankine's formula, the minimum depth of foundation

[A.](#)  $h = \frac{P}{W} \left( \frac{1 - \sin \phi}{1 + \sin \phi} \right)^2$

[B.](#)  $h = \frac{W}{P} \left( \frac{1 - \sin \phi}{1 + \sin \phi} \right)^2$

[C.](#)  $h = \frac{P}{w} \left( \frac{1 - \sin \phi}{1 + \tan \phi} \right)^2$

[D.](#)  $h = \frac{P}{w} \left( \frac{1 - \tan \phi}{1 + \tan \phi} \right)^2$

1. Pick up the cohesive soil from the following:

- [A.](#) Red earth
- [B.](#) Clay
- [C.](#) **Black cotton soil**
- [D.](#) Compacted ground.

---

2. Pile foundations are generally preferred to for

- [A.](#) bridge foundations
- [B.](#) **sky scrapper buildings**
- [C.](#) residential buildings
- [D.](#) runways.

---

3. The angle of internal friction of clays, is usually

- [A.](#)  $0^\circ$  to  $5^\circ$
  - [B.](#)  **$5^\circ$  to  $20^\circ$**
  - [C.](#)  $20^\circ$  to  $30^\circ$
  - [D.](#)  $30^\circ$  to  $45^\circ$
-

4. If the bulk density of the soil is  $\rho$  and water content  $\omega$ , then dry density of the soil, is

A.  $1 + \frac{\omega}{\rho}$

B.  $\frac{1 + \rho}{\omega}$

C.  $\frac{\rho}{1 + \omega}$

D.  $\frac{\omega}{1 + \rho}$

---

5. The specific yield of soil depends upon

A. compaction of stratum

B. distribution of pores

C. shape and size of particles

D. all the above.

6. The area of cross-section  $A$  at failure or during any stage of Triaxial Compression Test and its initial length ( $L$ ) and volume ( $V$ ), are related by the equation

A.  $A = \frac{V + \Delta V}{L - \Delta L}$

B.  $A = \frac{V - \Delta V}{V + \Delta L}$

C.  $A = \frac{V - \Delta V}{L - \Delta L}$

D.  $A = \frac{V + \Delta V}{L + \Delta L}$

---

7. Pick up the correct statement from the following:

A. In hydrometer method, weight  $W_d$  per ml of suspension is found directly

B. In pipette analysis, weight  $W_d$  per ml of suspension is found indirectly

C. In pipette analysis, weight  $W_d$  per ml of suspension is found directly

D. None of these.

---

8. Pick up the correct statement from the following:

A. Coefficient of compressibility is the decrease in void ratio per unit increase of pressure

B. The percent settlement at any time is called degree of consolidation

C. Time factor is a dimensionless quantity

D. The initial curve on either side of the point of unloading and reloading is called 'virgin curve'

E. All the above.

9. 'Loess' is silty clay formed by the action of

- [A.](#) water
  - [B.](#) glacier
  - [C.](#) wind**
  - [D.](#) gravitational force.
- 

10. The maximum possible value of dry density is referred to as

- [A.](#) dry density
  - [B.](#) zero air voids
  - [C.](#) saturation dry density
  - [D.](#) all the above.**
- 

11. The void ratio of the soil sample stated in Q. No. 216, is

- [A.](#) 0.4
  - [B.](#) 0.5
  - [C.](#) 0.6**
  - [D.](#) 0.75
- 

12. The bulk density of the soil sample stated in Q. No. 11.243, is

- [A.](#) 1.4 g/cc
  - [B.](#) 1.6 g/cc
  - [C.](#) 1.8 g/cc**
  - [D.](#) 2.0 g/cc
- 

13. Failure of a slope occurs only when total shear force is

- [A.](#) equal to total shearing strength
  - [B.](#) greater than total shearing strength**
  - [C.](#) less than total shearing strength
  - [D.](#) none of these.
- 

14. Pick up the correct statement from the following:

- [A.](#) A soil having pH value more than 7 is an acidic soil
  - [B.](#) A soil having pH value less than 7 is an acidic soil**
  - [C.](#) A soil having pH value more than 7 is an alkaline soil
  - [D.](#) A soil containing chemicals for the manufacture of portland cement is preferred.
- 

15. Cohesionless soil is

- [A.](#) sand**
  - [B.](#) silt
  - [C.](#) clay
  - [D.](#) clay and silt.
- 

16. The shearing force acting along the slice of a curved surface of slippage, causes the soil to slide

- [A.](#) down at the centre**
  - [B.](#) down at the toe
  - [C.](#) upward at the centre
  - [D.](#) none of these.
-

17. The seepage exit gradient in a soil is the ratio of
- A.total head to the length of seepage
  - B.flow line to slope
  - C.head upstream to that at downstream
  - D.head loss to the length of the seepage**
  - E. none of these.
- 

18. Sedimentation analysis is based on the assumption:
- A.soil particles are spherical
  - B.particles settle independent of other particles
  - C.walls of the jar do not affect the settlement .
  - D.all the above.**
- 

19. If  $C_s$  is the expansion index in Q. 11.165, the empirical formula given by Terzaghi, is
- A. $e = e_0 - C_d \log_{10} \sigma'/\sigma_0'$
  - B. $e = e_0 + C_d \log_{10} \sigma'/\sigma_0'$**
  - C. $e_0 = e - C_d \log_{10} \sigma'/\sigma_0'$
  - D. $e^\circ = e + C_d \log_{10} \sigma'/\sigma_0'$
- 

20. The maximum pressure which a soil can carry without shear failure, is called
- A.safe bearing capacity**
  - B.net safe bearing capacity
  - C.net ultimate bearing capacity
  - D.ultimate bearing capacity.

21. For general engineering purposes, soils are classified by
- A.particle size classification system
  - B.textural classification system
  - C.High Way Research Board (HRB), classification system
  - D.unified soil classification system.**
- 

22. If there is no impervious boundary at the bottom of a hydraulic structure, stream lines tend to follow :
- A.a straight line
  - B.a parabola
  - C.a semi-ellipse**
  - D.a semi-circle.
- 

23. The change of moisture content of soils, changes the
- A.value of the angle of repose
  - B.amount of compaction required
  - C.cohesive strength of soil
  - D.all the above.**
-

24. A failure wedge develops if a retaining wall

- A. moves away from the backfill**
  - B. moves towards the backfill
  - C. sinks downwards
  - D. stresses equally by vertical and horizontal forces.
- 

25. For determining the ultimate bearing capacity of soil, the recommended size of a square bearing plate to be used in load plate test should be 30 to 75 cm square with a minimum thickness of

- A. 5 mm
  - B. 10 mm
  - C. 15 mm
  - D. 20 mm
  - E. 25 mm**
- 

26. The water content in a soil sample when it continues to loose weight without loosing the volume, is called

- A. Shrinkage limit**
  - B. Plastic limit
  - C. liquid limit
  - D. semi-solid limit.
- 

27. The intensity of vertical pressure at a depth  $Z$  directly below the point load  $Q$  on its axis of loading is :

- A.  $\frac{0.4775 Q}{Z}$
  - B.  $\frac{0.4775 Q}{Z^2}$
  - C.  $\frac{0.4775 Q}{Z^3}$
  - D.  $\frac{0.4775 Q}{\sqrt{Z}}$
- 

28. When a cohesionless soil attains quick condition, it loses

- A. shear strength
  - B. bearing capacity
  - C. both (a) and (b)**
  - D. neither (a) nor (b).
-

29. Pick up the correct definition from the following:

A. The lateral pressure exerted by the soil when the retaining wall moves away from the back fill, is generally known as active earth pressure of the soil

B. The lateral pressure exerted by the soil when the retaining wall moves towards the soil, is generally known as 'Passive earth pressure of the soil'

C. The lateral pressure exerted by the soil when the retaining wall has no movement relative to the back fill, is known as 'earth pressure at rest of the soil'

D. **All the above.**