Civil Engineering

1. The stone that exhibits the highest compressive strength among the following is:

A) Sandstone

B) Limestone

C) Granite

D) Slate

Answer: C) Granite

Explanation: Granite is an igneous rock with a crystalline structure, making it extremely hard, dense, and strong in compression, which is why it is often used in foundations and as a structural stone.

2. A floor constructed with short wooden boards arranged in a geometric pattern is known as:

A) Plank flooring

B) Parquet flooring

C) Wood block flooring

D) Laminate flooring

Answer: B) Parquet flooring

Explanation: Parquet flooring is a decorative type of flooring made from small blocks or strips of wood laid in various patterns like herringbone or chevron.

3. An imaginary line on the ground that maintains a constant slope is known as a:

A) Contour line

B) Level line

C) Contour gradient

D) Horizontal line

Answer: C) Contour gradient

Explanation: A contour gradient is a line laid out on the ground with a specific, constant gradient. It is used for aligning roads, canals, and railways in hilly areas.

4. The ratio of the volume of voids to the volume of solid particles in a soil mass is the:

A) Porosity

B) Void ratio

C) Air content

D) Degree of saturation

Answer: B) Void ratio

Explanation: Void ratio (e) is a fundamental index property of soils, defined as $e = V_v / V_s$. Unlike porosity, its denominator is the volume of solids, so its value can exceed 1.

5. For an object floating in a liquid, the metacenter is the point of intersection of the line of action of the buoyant force and:

A) The centerline of the object

B) The original vertical axis through the center of gravity

C) The water surface

D) The center of buoyancy

Answer: B) The original vertical axis through the center of gravity

Explanation: When a floating body is tilted, the center of buoyancy shifts. The metacenter (M) is the point where the new line of action of the buoyant force intersects the initial vertical axis. The stability of the body depends on the position of M relative to the center of gravity (G).

6. A frame in which the number of members is less than (2j - 3), where 'j' is the number of joints, is a:

A) Perfect frame

B) Imperfect or deficient frame

C) Redundant frame

D) Determinate frame

Answer: B) Imperfect or deficient frame

Explanation: A deficient frame has fewer members than required for stability and will collapse under the action of external loads. It is a mechanism. A perfect frame satisfies m = 2j - 3.

7. The partial safety factor for steel reinforcement in the limit state design of concrete structures is:

A) 1.0

B) 1.15

C) 1.25

D) 1.5

Answer: B) 1.15

Explanation: According to IS 456:2000, a partial safety factor of 1.15 is applied to the characteristic strength of steel. This is lower than the factor for concrete (1.5) because steel is produced in a more controlled factory environment, leading to less variability in its properties.

8. The process of burning bricks in a kiln is known as:

A) Curing

B) Seasoning

C) Burning or Firing

D) Moulding

Answer: C) Burning or Firing

Explanation: Burning imparts hardness, strength, and durability to the bricks by fusing the sand and clay particles together. It is a critical stage in the brick manufacturing process.

9. The type of water main that supplies water to various localities within a city from the main supply line is a:

A) Service pipe

B) Main pipe

C) Branch pipe

D) Distribution pipe

Answer: D) Distribution pipe

Explanation: The distribution system is the network of pipes that branches off from the main transmission lines to deliver water to smaller areas and ultimately to individual service connections.

10. The first stage in the life cycle of a construction project is:

A) Design

B) Construction

C) Feasibility and Conception

D) Tendering

Answer: C) Feasibility and Conception

Explanation: The project life cycle begins with the initial idea or need. The conception and feasibility stage involves defining the project's objectives, assessing its viability, and making the initial decision to proceed.

11. The presence of excess lime in brick earth results in:

A) The brick becoming brittle

B) The brick melting and losing its shape

C) The brick cracking and warping

D) A change in the color of the brick

Answer: B) The brick melting and losing its shape

Explanation: If lime is present in excess, it acts as a flux in the kiln during burning, causing the brick to melt, distort, and lose its shape.

12. The final coat of plaster, typically very thin and smooth, is called the:

A) Undercoat

B) Floating coat

C) Setting coat or finishing coat

D) Rendering coat

Answer: C) Setting coat or finishing coat

Explanation: This final layer provides the smooth, dense surface that is ready for painting or decorating. It is usually made with a fine plaster mix.

13. The whole circle bearing of a line is 120°. Its reduced bearing is:

A) N 60° E

B) S 60° E

C) N 120° E

D) S 30° E

Answer: B) S 60° E

Explanation: A whole circle bearing of 120° is in the second quadrant (SE). The reduced bearing is the angle measured from the South meridian, which is 180° - 120° = 60°. Therefore, it is S 60° E.

14. Darcy's law for flow through porous media states that the velocity of flow is:

A) Proportional to the hydraulic gradient

B) Inversely proportional to the hydraulic gradient

C) Proportional to the square of the hydraulic gradient

D) Independent of the hydraulic gradient

Answer: A) Proportional to the hydraulic gradient

Explanation: Darcy's law is expressed as $v = ki$, where v is the discharge velocity, k is the coefficient of permeability, and i is the hydraulic gradient. It is the fundamental law governing groundwater flow.

15. The stability of a dam against overturning is checked by ensuring that the resultant force passes through the:

A) Crown of the dam

B) Toe of the dam

C) Middle-third of the base

D) Heel of the dam

Answer: C) Middle-third of the base

Explanation: According to the middle-third rule, to prevent tensile stresses from developing at the heel of the dam, the resultant of all forces (self-weight, water pressure, uplift) must intersect the base within its middle third.

16. The energy stored in a body when it is loaded within its elastic limit is known as:

A) Strain energy

B) Impact energy

C) Kinetic energy

D) Potential energy

Answer: A) Strain energy

Explanation: Strain energy is the internal work done in deforming a body. When the load is removed, this stored energy is released, and the body returns to its original shape.

17. The minimum number of longitudinal bars in a circular reinforced concrete column is:

A) 3

B) 4

C) 5

D) 6

Answer: D) 6

Explanation: As per IS 456:2000, a minimum of four bars are required for a rectangular or square column, and a minimum of six bars are required for a circular column to provide adequate bending resistance in all directions and to properly confine the concrete core.

18. The process of driving a series of timber piles close together to form a wall for excluding water is known as:

A) Sheet piling

B) Underpinning

C) Shoring

D) Caissoning

Answer: A) Sheet piling

Explanation: Sheet piles are interlocking sections of timber, steel, or concrete that are driven into the ground to form a continuous barrier, often used in retaining walls and cofferdams.

19. The biological process in which ammonia in wastewater is converted first to nitrite and then to nitrate is called:

A) Denitrification

B) Nitrification

C) Ammonification

D) Nitrogen fixation

Answer: B) Nitrification

Explanation: Nitrification is an essential aerobic process in advanced wastewater treatment for removing nitrogen. It is carried out by specific autotrophic bacteria (Nitrosomonas and Nitrobacter).

20. The document that provides a detailed description of the quality of materials and workmanship required for a construction project is the:

A) Bill of Quantities (BOQ)

B) Contract

C) Drawing

D) Specification

Answer: D) Specification

Explanation: Specifications are a crucial part of the contract documents. They supplement the drawings by providing detailed written requirements for every aspect of the work.

21. A defect in timber caused by the rupture of tissues in a circular direction around the pith is a:

A) Shake

B) Knot

C) Rind gall

D) Wane

Answer: A) Shake

Explanation: A shake is a separation along the grain of the wood. A ring shake is a separation between the annual growth rings.

22. A paint with a high percentage of pigment, used to provide a good base for the finishing coats, is a:

A) Enamel

B) Primer

C) Lacquer

D) Varnish

Answer: B) Primer

Explanation: A primer is the preparatory coating put on materials before painting. Priming ensures better adhesion of paint to the surface, increases paint durability, and provides additional protection for the material being painted.

23. The vertical angle measured between the horizontal and the line of sight is known as the angle of:

A) Declination

B) Azimuth

C) Bearing

D) Elevation or Depression

Answer: D) Elevation or Depression

Explanation: It is the angle of elevation if the line of sight is above the horizontal plane and the angle of depression if it is below the horizontal plane.

24. A soil sample has a total volume of V and a volume of solids of Vs. The porosity (n) is given by:

A) (V - Vs) / V

B) V / Vs

C) Vs / V

D) (V - Vs) / Vs

Answer: A) (V - Vs) / V

Explanation: The term (V - Vs) represents the volume of voids (Vv). Porosity is the ratio of the volume of voids to the total volume of the soil, so n = Vv / V = (V - Vs) / V.

25. The stability of a submerged body depends on the relative positions of its center of gravity and its:

A) Center of pressure

B) Metacenter

C) Center of buoyancy

D) Geometric center

Answer: C) Center of buoyancy

Explanation: For a fully submerged body, the metacenter is not a relevant concept. The body is in stable equilibrium if its center of gravity (G) is below its center of buoyancy (B).

26. The method of joints in truss analysis is used when:

A) The truss is statically indeterminate

B) The forces in all members are required

C) The forces in only a few members are required

D) The truss is subjected to moving loads

Answer: B) The forces in all members are required

Explanation: The method of joints involves analyzing the equilibrium of each joint in the truss sequentially. It is efficient when the forces in all or most of the members need to be determined. The method of sections is better for finding forces in a few specific members.

27. The development length of a reinforcing bar is the length required to:

A) Anchor the bar in a support

B) Transfer the stress from the bar to the surrounding concrete through bond

C) Overlap with another bar in a splice

D) Resist the shear force in the beam

Answer: B) Transfer the stress from the bar to the surrounding concrete through bond

Explanation: Development length is the minimum length of embedment required for a reinforcing bar to develop its full design stress without slipping or pulling out of the concrete.

28. A temporary structure erected to support the sides of an excavation and prevent a cave-in is:

A) Formwork

B) Shoring or Timbering

C) Scaffolding

D) Underpinning

Answer: B) Shoring or Timbering

Explanation: Shoring systems, consisting of members like struts, wales, and sheeting, are used to provide temporary support to the vertical faces of trenches and deep excavations.

29. The Total Dissolved Solids (TDS) in water can be determined by:

A) Titration with EDTA

B) Using a turbidimeter

C) Evaporating a filtered sample to dryness and weighing the residue

D) The Winkler method

Answer: C) Evaporating a filtered sample to dryness and weighing the residue

Explanation: TDS represents the total amount of inorganic salts and small amounts of organic matter dissolved in water. The gravimetric method of evaporating a known volume of filtered water and weighing the solid residue is the standard method for its measurement.

30. The "float" or "slack" of an activity in a project network represents the:

A) Time the activity can be delayed without affecting the project duration

B) Duration of the activity

C) Time required to complete the activity

D) Cost of delaying the activity

Answer: A) Time the activity can be delayed without affecting the project duration

Explanation: Float is a measure of the flexibility in scheduling an activity. Activities on the critical path have zero float, meaning any delay in these activities will delay the entire project.

31. The hardest rock is:

A) Marble

B) Diamond

C) Quartz

D) Talc

Answer: B) Diamond

Explanation: On the Mohs scale of mineral hardness, diamond is rated as 10, the highest possible value, making it the hardest known natural substance. Talc is the softest, with a rating of 1.

32. The lower edge of a sloping roof is called the:

A) Ridge

B) Hip

C) Gable

D) Eaves

Answer: D) Eaves

Explanation: The eaves are the part of the roof that meets or overhangs the walls of a building. They are typically where gutters are installed to collect rainwater.

33. A check line in a chain survey is run to:

A) Mark the boundaries of the area

B) Take offsets for nearby objects

C) Check the accuracy of the framework

D) Form a well-conditioned triangle

Answer: C) Check the accuracy of the framework

Explanation: A check line (or proof line) is a line measured on the ground between two known points on the survey framework. The measured length is then compared to the length plotted on the map to verify the accuracy of the survey work.

34. The phenomenon of water rising in a small-diameter tube above the general water level is known as:

A) Viscosity

B) Surface tension

C) Capillarity

D) Osmosis

Answer: C) Capillarity

Explanation: Capillarity (or capillary action) is caused by the combined effects of surface tension of the liquid and the adhesive forces between the liquid and the tube walls. This phenomenon is important for the movement of water in soils.

35. The upper surface of the zone of saturation in the ground is called the:

A) Water table

B) Piezometric surface

C) Aquifer

D) Aquiclude

Answer: A) Water table

Explanation: The water table is the level below which the ground is saturated with water. The pressure at the water table is equal to the atmospheric pressure.

36. The point of contraflexure is a point where:

A) The shear force is zero

B) The bending moment is maximum

C) The bending moment changes its sign

D) The deflection is zero

Answer: C) The bending moment changes its sign

Explanation: At the point of contraflexure, the bending moment is zero. This is the point where the curvature of the beam's elastic curve changes from sagging (positive moment) to hogging (negative moment) or vice versa.

37. A structural member subjected to an axial tensile force is called a:

A) Strut

B) Column

C) Tie

D) Beam

Answer: C) Tie

Explanation: A tie is a tension member. Common examples include the bottom chord of a simple roof truss and the hangers in a suspension bridge. A strut is a compression member.

38. The load factor is defined as the ratio of:

A) Working load to ultimate load

B) Ultimate load to working load

C) Yield stress to working stress

D) Ultimate stress to yield stress

Answer: B) Ultimate load to working load

Explanation: The load factor is a factor of safety related to loads. It is the factor by which the working loads (service loads) are multiplied to get the design loads (ultimate loads) in limit state design.

39. The process of removing iron and manganese from water is called:

A) Softening

B) Aeration and oxidation

C) Disinfection

D) Coagulation

Answer: B) Aeration and oxidation

Explanation: Iron and manganese are often present in groundwater in a dissolved state. Aeration introduces oxygen, which oxidizes the dissolved iron and manganese into insoluble forms that can then be removed by filtration.

40. An earnest money deposit (EMD) submitted by a contractor with a tender is forfeited if:

A) The contractor's bid is the lowest

B) The contractor withdraws the tender before it is accepted

C) The contractor's bid is too high

D) The project is canceled by the owner

Answer: B) The contractor withdraws the tender before it is accepted

Explanation: The EMD serves as a guarantee that the bidder is serious about the offer and will not back out if the contract is awarded to them. If they withdraw their bid prematurely, the EMD is forfeited.

41. The decay of timber caused by the alternating wetting and drying is known as:

A) Dry rot

B) Wet rot

C) Foxiness

D) Brown rot

Answer: B) Wet rot

Explanation: Wet rot is caused by fungi that thrive in damp conditions where the timber is exposed to cycles of wetting and drying. It causes the wood to decompose into a fibrous or spongy mass.

42. The most common type of foundation used for single-story residential buildings on stable soil is:

A) Pile foundation

B) Raft foundation

C) Strip footing

D) Caisson foundation

Answer: C) Strip footing

Explanation: For light loads and good soil conditions, a continuous strip footing under the load-bearing walls is the most economical and common type of shallow foundation.

43. The magnetic bearing of a line is S 45° E. If the magnetic declination is 5° West, the true bearing is:

A) S 40° E

B) S 50° E

C) S 45° W

D) N 40° E

Answer: A) S 40° E

Explanation: West declination means the magnetic north is west of true north. For a line in the SE quadrant, the true bearing will be less than the magnetic bearing. True Bearing = Magnetic Bearing - Declination = 45° - 5° = 40°. So, S 40° E.

44. A soil that has been transported and deposited by rivers is known as:

A) Aeolian soil

B) Alluvial soil

C) Marine soil

D) Lacustrine soil

Answer: B) Alluvial soil

Explanation: Alluvial soils are found in floodplains, river deltas, and alluvial fans. They are typically fertile and are often well-graded mixtures of sand, silt, and clay.

45. The ratio of the shear stress to the shear strain of a material is known as the:

A) Modulus of elasticity

B) Bulk modulus

C) Modulus of rigidity or Shear modulus

D) Poisson's ratio

Answer: C) Modulus of rigidity or Shear modulus

Explanation: The modulus of rigidity (G) is a measure of a material's resistance to shear deformation. It is related to the modulus of elasticity (E) and Poisson's ratio (ν) by the formula $G = E / [2(1+\nu)]$.

46. The bottom-most component of a typical flexible pavement is the:

A) Seal coat

B) Surface course

C) Base course

D) Subgrade

Answer: D) Subgrade

Explanation: The subgrade is the natural or prepared soil layer that forms the foundation of the pavement structure. The performance of the pavement is critically dependent on the strength and stability of the subgrade.

47. The traffic sign that is triangular in shape is generally a:

A) Mandatory sign

B) Warning sign

C) Informatory sign

D) Regulatory sign

Answer: B) Warning sign

Explanation: Warning signs (e.g., "Curve Ahead," "Pedestrian Crossing") are typically triangular with a white background and red border to alert drivers to potential hazards.

48. A vertical member in a building frame that is designed to resist lateral forces like wind or earthquakes is a:

A) Column

B) Beam

C) Slab

D) Shear wall

Answer: D) Shear wall

Explanation: A shear wall is a structural element that provides lateral stiffness and strength to a building. It acts like a tall, cantilevered beam to resist horizontal forces.

49. The presence of pathogenic bacteria in water is often indicated by the presence of:

A) Algae

B) Viruses

C) Coliform bacteria

D) Protozoa

Answer: C) Coliform bacteria

Explanation: Coliform bacteria, particularly E. coli, are used as indicator organisms. They are not usually pathogenic themselves, but their presence indicates that the water has been contaminated with fecal matter and may therefore contain disease-causing pathogens.

50. The value of a property as recorded in the account books of a company or individual is its:

A) Market value

B) Book value

C) Salvage value

D) Assessed value

Answer: B) Book value

Explanation: The book value is the original cost of an asset minus its accumulated depreciation. It represents the remaining undepreciated value of the asset for accounting purposes.

51. The wood from deciduous trees (like oak and teak) is classified as:

A) Softwood

B) Hardwood

C) Plywood

D) Veneer

Answer: B) Hardwood

Explanation: Hardwoods come from broad-leaved (deciduous) trees. They are generally denser and more durable than softwoods, which come from coniferous (cone-bearing) trees.

52. The type of arch in which the number of hinges is three is a:

A) Fixed arch

B) Two-hinged arch

C) Three-hinged arch

D) Linear arch

Answer: C) Three-hinged arch

Explanation: A three-hinged arch is a statically determinate structure. The three hinges (usually at the two supports and the crown) make it possible to solve for the reactions using only the equations of static equilibrium.

53. The curvature of the Earth is taken into account in surveying if the extent of the area is more than:

A) 100 sq km

B) 150 sq km

C) 200 sq km

D) 250 sq km

Answer: D) 250 sq km

Explanation: For small areas, the Earth's surface can be assumed to be a plane (plane surveying). For larger areas, the curvature must be considered (geodetic surveying) to maintain accuracy. The conventional limit is around 250 sq km.

54. The process by which a saturated, loose sand deposit loses its strength and behaves like a liquid during an earthquake is:

A) Consolidation

B) Compaction

C) Liquefaction

D) Swelling

Answer: C) Liquefaction

Explanation: The seismic shaking increases the pore water pressure in the sand, which reduces the effective stress between the sand grains to near zero. This causes a temporary loss of shear strength, leading to ground failure.

55. The maximum deflection of a simply supported beam of span 'L' carrying a point load 'W' at its center is:

A) $WL^3 / (3 EI)$

B) $WL^3 / (8 EI)$

C) $WL^3 / (48 EI)$

D) $5WL^4 / (384 EI)$

Answer: C) $WL^3 / (48 EI)$

Explanation: This is a standard formula for beam deflection, essential for checking the serviceability (stiffness) of a beam design. The formula for a UDL is $5WL^4 / (384 EI)$.

56. The end support of a bridge superstructure is called a/an:

A) Pier

B) Abutment

C) Wing wall

D) Approach slab

Answer: B) Abutment

Explanation: An abutment supports the end of the bridge span and also retains the soil of the approach embankment behind it. A pier is an intermediate support for a multi-span bridge.

57. The type of water meter that is suitable for measuring high flows with minimum head loss, such as on a main supply line, is a:

A) Displacement meter

B) Velocity meter

C) Orifice meter

D) Weir

Answer: B) Velocity meter

Explanation: Velocity meters, like turbine or propeller meters, infer the volume of flow by measuring the speed of the water moving through them. They are less accurate than displacement meters at low flows but are ideal for large pipelines.

58. The wearing course of a road pavement, which is in direct contact with the vehicle tires, is the:

A) Subgrade

B) Sub-base course

C) Base course

D) Surface course

Answer: D) Surface course

Explanation: The surface course must be strong enough to resist the high stresses from the wheels, smooth enough to provide good ride quality, and textured enough to provide skid resistance.

59. An organization chart shows the:

A) Project schedule

B) Cost breakdown of the project

C) Lines of authority and responsibility within the organization

D) Physical layout of the project site

Answer: C) Lines of authority and responsibility within the organization

Explanation: The organization chart is a graphical representation of the formal structure of a project or company, showing the relationships between different roles and departments.

60. The type of glass that is made by sandwiching a thin layer of plastic (polyvinyl butyral) between two or more layers of glass is:

A) Tempered glass

B) Float glass

C) Laminated glass

D) Wired glass

Answer: C) Laminated glass

Explanation: Laminated glass is a type of safety glass. When it breaks, the glass fragments stick to the plastic interlayer rather than shattering into dangerous pieces. It is commonly used for car windshields and security glazing.