

Civil Engineering

1. A naturally occurring silica that is rich in silica and is used as a cementitious material in making concrete is:

- A) Gypsum
- B) Pozzolana
- C) Bauxite
- D) Lime

Answer: B) Pozzolana

Explanation: Pozzolanas are siliceous or siliceous and aluminous materials which in themselves possess little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

2. The type of roof that slopes in four directions is called a:

- A) Gable roof
- B) Gambrel roof
- C) Mansard roof
- D) Hip roof

Answer: D) Hip roof

Explanation: A hip roof has slopes on all four sides. The sides are all equal in length and come together at the top to form a ridge.

3. The operation of removing humps and depressions from a ground surface to form a uniform level or grade is known as:

- A) Excavation
- B) Grading
- C) Dressing
- D) Clearing

Answer: B) Grading

Explanation: Grading is the work of ensuring a level base or one with a specified slope for construction purposes like foundations, roads, or railways.

4. The vertical members placed at the top and bottom of a door shutter are called:

- A) Stiles
- B) Rails
- C) Mullions
- D) Transoms

Answer: B) Rails

Explanation: Rails are the horizontal members of a door shutter. The top member is the top rail, the middle is the lock rail, and the bottom is the bottom rail. Stiles are the vertical members.

5. The ability of a paint to hide the surface beneath it is known as its:

- A) Viscosity
- B) Opacity or Hiding Power
- C) Sheen
- D) Durability

Answer: B) Opacity or Hiding Power

Explanation: Opacity is a crucial property of paint, indicating how well it can cover the previous color or imperfections on the surface with the fewest coats.

6. The correction for sag in a surveying chain or tape is always:

- A) Positive
- B) Negative
- C) Zero
- D) Dependent on the temperature

Answer: B) Negative

Explanation: Due to its self-weight, a tape or chain sags between supports, forming a catenary. This makes the measured length along the curve longer than the true horizontal distance. The correction is therefore subtractive.

7. The method of levelling used to carry levels across a wide river or valley where the instrument cannot be set up in the middle is:

- A) Profile Levelling
- B) Fly Levelling
- C) Differential Levelling
- D) Reciprocal Levelling

Answer: D) Reciprocal Levelling

Explanation: Reciprocal levelling involves taking readings from both banks of the obstacle to cancel out instrumental errors and the effects of Earth's curvature and atmospheric refraction.

8. In the Global Positioning System (GPS), a minimum of how many satellites are required to determine a 3D position (latitude, longitude, and altitude)?

- A) 2
- B) 3
- C) 4
- D) 5

Answer: C) 4

Explanation: Three satellites are required to find a 2D position (trilateration). A fourth satellite is needed to solve for the fourth unknown, which is the receiver's clock error, thus providing a precise 3D position.

9. The process of creating a digital representation of the Earth's surface, including terrain and surface features, is known as:

- A) Cartography
- B) Geocoding
- C) Digital Elevation Modeling (DEM)
- D) Spatial Analysis

Answer: C) Digital Elevation Modeling (DEM)

Explanation: A DEM is a 3D computer graphics representation of surface topography, commonly used in geographic information systems (GIS) for various analyses like slope, aspect, and watershed delineation.

10. The time-dependent settlement of a saturated clay layer under a constant load is called:

- A) Compaction
- B) Immediate Settlement
- C) Consolidation
- D) Swelling

Answer: C) Consolidation

Explanation: Consolidation is the process by which a soil's volume decreases due to the gradual expulsion of pore water from the voids under a sustained load. It is a key consideration in the design of foundations on clay.

11. The liquid limit and plastic limit of a soil exist in:

- A) Sandy soils
- B) Gravelly soils
- C) Coarse-grained soils
- D) Fine-grained soils

Answer: D) Fine-grained soils

Explanation: The Atterberg limits (liquid limit, plastic limit, shrinkage limit) are measures of the water content at different consistency states, and they are characteristic of cohesive, fine-grained soils like clays and silts.

12. A deep foundation that is constructed by boring a hole into the ground and filling it with concrete and reinforcement is a:

- A) Raft foundation
- B) Spread footing
- C) Bored pile or drilled pier
- D) Well foundation

Answer: C) Bored pile or drilled pier

Explanation: Bored piles are cast-in-situ foundations used when driven piles are not feasible due to soil conditions or vibrations. They can be designed to carry very high loads.

13. The angle of repose of a soil is the maximum angle at which a slope of that soil is stable. It is roughly equal to the:

- A) Angle of internal friction
- B) Angle of wall friction
- C) Void ratio
- D) Porosity

Answer: A) Angle of internal friction

Explanation: For a dry, cohesionless soil, the angle of repose is approximately equal to its angle of internal friction (ϕ), which represents the shear strength of the material.

14. The method of structural analysis that involves distributing the moments at a rigid joint among the members connected to it is:

- A) Slope-Deflection Method
- B) Moment Distribution Method
- C) Force Method
- D) Finite Element Method

Answer: B) Moment Distribution Method

Explanation: Developed by Hardy Cross, the moment distribution method is an iterative technique for analyzing statically indeterminate beams and frames.

15. Pre-stressed concrete involves inducing:

- A) Compressive stresses in the concrete before applying the external loads
- B) Tensile stresses in the concrete before applying the external loads
- C) Shear stresses in the steel reinforcement
- D) Tensile stresses in both steel and concrete

Answer: A) Compressive stresses in the concrete before applying the external loads

Explanation: By pre-compressing the concrete in zones where external loads would normally cause tension, the load-carrying capacity of the member is significantly increased, allowing for longer spans and more slender sections.

16. In a plate girder, the vertical plates provided to stiffen the web against buckling are called:

- A) Flanges
- B) Web splices
- C) Bearing stiffeners
- D) Intermediate stiffeners

Answer: D) Intermediate stiffeners

Explanation: Intermediate transverse stiffeners are provided along the length of the girder to prevent shear buckling of the thin web panel. Bearing stiffeners are provided at supports and points of concentrated load.

17. The shape factor for a rectangular cross-section in plastic analysis is:

- A) 1.0
- B) 1.12
- C) 1.5
- D) 2.0

Answer: C) 1.5

Explanation: The shape factor is the ratio of the plastic moment capacity to the yield moment capacity of a section (M_p / M_y). For a rectangle, it is 1.5, indicating a 50% reserve of strength beyond the initial yielding.

18. The sudden loss of head in a pipe due to the abrupt closure of a valve is known as:

- A) Cavitation
- B) Water hammer
- C) Corrosion
- D) Friction loss

Answer: B) Water hammer

Explanation: The rapid valve closure converts the kinetic energy of the flowing water into a high-pressure shock wave that propagates through the pipe, creating a hammering noise and potentially damaging the pipe system.

19. A hydraulic machine that converts the kinetic energy of water into mechanical energy is a:

- A) Centrifugal pump
- B) Reciprocating pump
- C) Hydraulic turbine
- D) Hydraulic ram

Answer: C) Hydraulic turbine

Explanation: Turbines, such as the Pelton wheel, Francis turbine, and Kaplan turbine, are used in hydropower plants to drive generators and produce electricity from the energy of flowing water.

20. In open channel flow, the specific energy is the:

- A) Total energy above the channel bed
- B) Total energy above a reference datum
- C) Kinetic energy of the flow
- D) Potential energy of the flow

Answer: A) Total energy above the channel bed

Explanation: Specific energy (E) is the sum of the depth of flow (potential energy head) and the velocity head (kinetic energy head), i.e., $E = y + v^2 / 2g$.

21. A line connecting points of equal rainfall depth for a given storm duration is a/an:

- A) Isobar
- B) Isotherm
- C) Isohyet
- D) Isochrone

Answer: C) Isohyet

Explanation: Isohyetal maps are used in hydrology to represent the spatial distribution of rainfall over an area, which is essential for calculating the average rainfall over a catchment.

22. The process in which nutrients, especially nitrogen and phosphorus, enrich a body of water, leading to excessive growth of algae is called:

- A) Eutrophication
- B) Denitrification
- C) Ozonation
- D) Sedimentation

Answer: A) Eutrophication

Explanation: Cultural eutrophication, caused by runoff from agriculture and urban areas, can lead to algal blooms, oxygen depletion (hypoxia), and the death of aquatic life.

23. A device used to control air pollution by removing particulate matter from industrial exhaust gases is the:

- A) Scrubber
- B) Electrostatic precipitator
- C) Activated carbon filter
- D) Trickling filter

Answer: B) Electrostatic precipitator

Explanation: An ESP uses high-voltage electrostatic charges to make particles stick to charged plates, allowing them to be collected and removed from the gas stream with high efficiency.

24. The primary component of landfill gas, which is produced by the anaerobic decomposition of solid waste, is:

- A) Oxygen
- B) Nitrogen
- C) Methane
- D) Hydrogen sulfide

Answer: C) Methane

Explanation: Landfill gas is typically composed of about 50% methane (CH_4) and 50% carbon dioxide (CO_2). Methane is a potent greenhouse gas but can also be captured and used as a source of energy.

25. A traffic signal that operates based on the real-time traffic demand detected by sensors is called a/an:

- A) Pre-timed signal
- B) Actuated signal
- C) Coordinated signal
- D) Flashing signal

Answer: B) Actuated signal

Explanation: Actuated signals are more efficient than fixed-time signals as they can adjust the green time allocated to each approach based on the presence of vehicles, reducing unnecessary delays.

26. The flexible pavement layer that is located directly above the subgrade and is made of crushed stone or gravel is the:

- A) Seal coat
- B) Surface course
- C) Base course
- D) Sub-base course

Answer: D) Sub-base course

Explanation: The sub-base course is a key structural layer that provides drainage, prevents frost action, and distributes the load from the pavement to the subgrade. The base course is placed above it.

27. The cant deficiency on a railway track occurs when a train travels around a curve:

- A) At the equilibrium speed
- B) Slower than the equilibrium speed
- C) Faster than the equilibrium speed
- D) With no cant provided

Answer: C) Faster than the equilibrium speed

Explanation: When a train travels faster than the speed for which the cant (superelevation) was designed, the centrifugal force is not fully balanced, resulting in a net force towards the outer rail, known as cant deficiency.

28. The type of contract where a single contractor is responsible for both the design and construction of a project is known as a:

- A) Lump-sum contract
- B) Cost-plus contract
- C) Design-Build contract
- D) Unit-price contract

Answer: C) Design-Build contract

Explanation: The Design-Build (or Turnkey) method streamlines project delivery by having a single point of responsibility for both design and construction phases, potentially saving time and money.

29. The method of depreciation in which the value of an asset decreases by a constant amount each year is the:

- A) Straight-line method
- B) Declining balance method
- C) Sum-of-the-years'-digits method
- D) Sinking fund method

Answer: A) Straight-line method

Explanation: This is the simplest method of depreciation, where the annual depreciation amount is calculated by subtracting the salvage value from the initial cost and dividing by the useful life of the asset.

30. In a PERT network, the time that an activity would take if everything proceeds exceptionally well is the:

- A) Most likely time (t_m)
- B) Pessimistic time (t_p)
- C) Optimistic time (t_o)
- D) Expected time (t_e)

Answer: C) Optimistic time (t_o)

Explanation: PERT uses three time estimates to account for uncertainty. The optimistic time is the shortest possible time in which the activity can be completed.

31. A temporary watertight enclosure built in a water body to allow construction work to be done on a dry footing is a:

- A) Caisson
- B) Cofferdam
- C) Pier
- D) Abutment

Answer: B) Cofferdam

Explanation: A cofferdam is constructed to dewater an area, for example, to build a bridge pier in a river. After the construction is complete, the cofferdam is typically removed.

32. The process of injecting a fluid-like material (grout) into a rock or soil formation to improve its strength or reduce its permeability is called:

- A) Grouting
- B) Dewatering
- C) Shotcreting
- D) Piling

Answer: A) Grouting

Explanation: Grouting is widely used in tunnelling, dam foundations, and ground improvement to control groundwater flow and stabilize the soil or rock mass.

33. The top part of a tunnel's arched section is called the:

- A) Invert
- B) Crown
- C) Haunch
- D) Sidewall

Answer: B) Crown

Explanation: The crown is the highest point of the tunnel arch. The invert is the bottom, curved section of the tunnel, which often serves as the floor.

34. A long wall or embankment built to protect land from flooding from the sea or a river is a:

- A) Dike or Levee
- B) Groin
- C) Seawall
- D) Jetty

Answer: A) Dike or Levee

Explanation: Levees are earth embankments built parallel to a river to contain its flow during high water stages and prevent widespread flooding. Dikes serve a similar purpose along coastlines.

35. A coastal structure built perpendicular to the shoreline to trap sand moving along the coast (longshore drift) and build up a beach is a:

- A) Breakwater
- B) Seawall
- C) Groin
- D) Revetment

Answer: C) Groin

Explanation: Groins are used for beach stabilization. They interrupt the longshore transport of sand, causing sand to accumulate on the updrift side, but they can cause erosion on the downdrift side.

36. The rate of interest at which the present value of cash inflows equals the present value of cash outflows for a project is the:

- A) Net Present Value (NPV)
- B) Benefit-Cost Ratio (BCR)
- C) Internal Rate of Return (IRR)
- D) Payback Period

Answer: C) Internal Rate of Return (IRR)

Explanation: The IRR is a key metric in engineering economy. A project is generally considered acceptable if its IRR is greater than the minimum attractive rate of return (MARR) or the cost of capital.

37. The branch of surveying that takes into account the true shape and size of the Earth is:

- A) Plane Surveying
- B) Geodetic Surveying
- C) Cadastral Surveying
- D) Topographic Surveying

Answer: B) Geodetic Surveying

Explanation: Geodetic surveying is used for large-scale projects and for establishing precise control networks, as it accounts for the Earth's curvature in all calculations. Plane surveying assumes the Earth is flat.

38. The process of adding gypsum to cement clinker during its manufacturing is done to:

- A) Increase the strength
- B) Control the setting time
- C) Improve the color
- D) Reduce the cost

Answer: B) Control the setting time

Explanation: The compound C_3A in cement reacts very rapidly with water. Gypsum is added to slow down this reaction, preventing a "flash set" and allowing time for the concrete to be transported, placed, and finished.

39. The shear force at any section of a beam is equal to the rate of change of:

- A) Bending Moment at that section
- B) Deflection at that section
- C) Slope at that section
- D) Applied load at that section

Answer: A) Bending Moment at that section

Explanation: This fundamental relationship in beam theory is expressed as $V = dM/dx$, where V is the shear force and M is the bending moment. Similarly, the rate of change of shear force is the applied load, $w = dV/dx$.

40. The type of flow in which the fluid particles move in a random and chaotic manner, with significant mixing, is:

- A) Laminar flow
- B) Turbulent flow
- C) Steady flow
- D) Uniform flow

Answer: B) Turbulent flow

Explanation: Turbulent flow is characterized by a high Reynolds number and is the most common type of flow found in engineering applications, such as in rivers and large pipes.

41. In an RCC beam, the side face reinforcement is provided when the depth of the web exceeds:

- A) 500 mm
- B) 600 mm
- C) 750 mm
- D) 1000 mm

Answer: C) 750 mm

Explanation: As per IS 456:2000, for deep beams where the web depth is greater than 750 mm, side face reinforcement is required to control cracking due to temperature and shrinkage and to resist lateral buckling of the web.

42. The process of developing a smooth and dense surface finish on a plastered wall using a steel trowel is called:

- A) Floating
- B) Troweling
- C) Curing

D) Hacking

Answer: B) Troweling

Explanation: Troweling is the final operation in plastering, done after the plaster has stiffened slightly, to create a hard, smooth, and impervious surface.

43. The property of a soil that describes its ability to allow water to flow through it is:

A) Porosity

B) Permeability

C) Capillarity

D) Compressibility

Answer: B) Permeability

Explanation: Permeability, quantified by the coefficient of permeability (k), is a crucial soil property for analyzing seepage through dams, estimating settlement, and designing drainage systems.

44. A weir with a sharp, thin edge is known as a:

A) Broad-crested weir

B) Ogee weir

C) Sharp-crested weir

D) Submerged weir

Answer: C) Sharp-crested weir

Explanation: Sharp-crested weirs, such as rectangular or V-notch weirs, are primarily used for measuring the flow rate in open channels due to their well-defined hydraulic characteristics.

45. The design of a highway vertical curve is primarily governed by:

A) Sight distance requirements

B) Centrifugal force

C) Superelevation

D) Pavement width

Answer: A) Sight distance requirements

Explanation: The length of a vertical curve (both summit and valley curves) must be sufficient to provide adequate stopping sight distance (and sometimes passing sight distance) for driver safety.

46. The standard size of a modular building brick as per Indian Standards is:

A) 230 mm x 110 mm x 70 mm

B) 200 mm x 100 mm x 100 mm

C) 190 mm x 90 mm x 90 mm

D) 220 mm x 105 mm x 65 mm

Answer: C) 190 mm x 90 mm x 90 mm

Explanation: This is the specified size of the brick itself. When laid with a 10 mm mortar joint, it becomes a nominal size of 200 mm x 100 mm x 100 mm, which simplifies calculations.

47. The point in a stressed body where the shear stress is maximum is located at an angle of _____ to the principal planes.

A) 0 degrees

B) 30 degrees

C) 45 degrees

D) 90 degrees

Answer: C) 45 degrees

Explanation: The planes of maximum shear stress are always oriented at 45 degrees to the principal planes (on which the normal stresses are maximum/minimum and shear stress is zero).

48. A canal outlet that maintains a constant discharge, irrespective of the water levels in the distributary or the watercourse, is a:

A) Non-modular outlet

B) Semi-modular outlet

C) Rigid modular outlet

D) Flexible outlet

Answer: C) Rigid modular outlet

Explanation: A rigid modular outlet is designed to provide a fixed discharge, which is essential for ensuring equitable distribution of water among farmers in an irrigation system.

49. The movement of vehicles in a separated lane or roadway in a specific direction is known as:

A) Traffic Volume

B) Traffic Density

C) Traffic Stream

D) Traffic Flow

Answer: C) Traffic Stream

Explanation: A traffic stream refers to the flow of traffic as a whole, characterized by parameters like speed, volume (flow), and density.

50. The value of an asset or property at any particular time during its useful life is known as its:

- A) Market Value
- B) Book Value
- C) Scrap Value
- D) Salvage Value

Answer: B) Book Value

Explanation: The book value is the original cost of the asset minus the accumulated depreciation up to that point in time. It is the value of the asset as recorded in the company's accounting books.

51. The foundation consisting of a thick reinforced concrete slab covering the entire area of a structure is called a:

- A) Strip footing
- B) Combined footing
- C) Strap footing
- D) Mat or Raft foundation

Answer: D) Mat or Raft foundation

Explanation: A raft foundation is used when soil bearing capacity is low or when column loads are heavy and close together, to spread the load over a large area and reduce differential settlement.

52. The type of bond in which a metal bolt is grouted into a drilled hole in rock to provide support is a:

- A) Welded bond
- B) Friction bond
- C) Rock bolt
- D) Adhesive bond

Answer: C) Rock bolt

Explanation: Rock bolting is a primary method of rock reinforcement used in tunnels, mines, and rock slopes to stabilize the rock mass by clamping potentially unstable blocks together.

53. In CPM, the latest time at which an activity can be finished without delaying the project completion is the:

- A) Earliest Finish Time (EFT)
- B) Latest Finish Time (LFT)
- C) Earliest Start Time (EST)

D) Latest Start Time (LST)

Answer: B) Latest Finish Time (LFT)

Explanation: The LFT is a critical parameter calculated during the backward pass of the network analysis. The difference between LFT and EFT for an activity is its total float.

54. The process of applying a thin layer of rich cement mortar over a concrete surface to provide a smooth finish or to hide defects is:

A) Plastering

B) Pointing

C) Punning

D) Grouting

Answer: C) Punning

Explanation: Punning is a finishing technique often applied to concrete ceilings or walls to create a level and smooth surface before painting.

55. The component of a bridge structure that directly supports the deck slab and transfers the load to the piers and abutments is the:

A) Foundation

B) Bearing

C) Girder or Beam

D) Pier cap

Answer: C) Girder or Beam

Explanation: The main longitudinal girders (which can be steel I-beams or concrete T-beams) are the primary load-carrying members spanning between the supports of a bridge.

56. The unit of dynamic viscosity in the SI system is:

A) m^2/s

B) Pascal (Pa)

C) Newton (N)

D) $\text{Pa}\cdot\text{s}$ or $\text{N}\cdot\text{s}/\text{m}^2$

Answer: D) $\text{Pa}\cdot\text{s}$ or $\text{N}\cdot\text{s}/\text{m}^2$

Explanation: Dynamic (or absolute) viscosity is a measure of a fluid's resistance to shear flow. The CGS unit is the Poise. Kinematic viscosity has units of m^2/s .

57. The water content of a soil at which it can just be rolled into a thread of 3 mm diameter without crumbling is the:

- A) Liquid Limit
- B) Plastic Limit
- C) Shrinkage Limit
- D) Permeability Limit

Answer: B) Plastic Limit

Explanation: The plastic limit is the lower boundary of the plastic state of a cohesive soil. It is a key parameter used in soil classification and for calculating the plasticity index.

58. The process of removing the entrapped air from fresh concrete by vibration or tamping is:

- A) Curing
- B) Segregation
- C) Compaction
- D) Bleeding

Answer: C) Compaction

Explanation: Proper compaction is vital to achieve dense, strong, and durable concrete by eliminating air voids, which would otherwise reduce the strength and allow ingress of water.

59. The type of door that opens horizontally by sliding along a track is a:

- A) Revolving door
- B) Collapsible door
- C) Sliding door
- D) Swing door

Answer: C) Sliding door

Explanation: Sliding doors are used where there is limited space for a door to swing open. They are common for closets, patios, and in some commercial buildings.

60. The "King Post" and "Queen Post" are components of a:

- A) Steel Truss
- B) Concrete Frame
- C) Timber Roof Truss
- D) Masonry Arch

Answer: C) Timber Roof Truss

Explanation: The king post truss (with a central vertical member) and the queen post truss (with two vertical members) are traditional and common types of timber trusses used to support sloping roofs over moderate spans.