

Technical Abilities (Civil): 100 MCQs

- Target Exam: RRB Junior Engineer (RRB JE)
- Study Notes Prepared for: Entri App Users

. Building Materials & Construction

Q1. The initial setting time of standard Ordinary Portland Cement (OPC) as per IS codes should not be less than:

- A) 15 minutes
- B) 30 minutes
- C) 60 minutes
- D) 600 minutes

Correct Answer: B) 30 minutes

Explanation: As per IS specifications, OPC must not set before 30 minutes to allow adequate time for mixing and placing.

Q2. The soundness of cement is tested to detect uncombined:

- A) Silica and Alumina
- B) Lime and Magnesia
- C) Iron oxide and Sulphur
- D) Calcium sulphate

Correct Answer: B) Lime and Magnesia

Explanation: Excess uncombined lime or magnesia causes volume changes and cracking after setting, checked via Le-Chatelier or autoclave tests.

Q3. Excess silica in brick earth causes bricks to become:

- A) Brittle and lose cohesion
- B) Hard and impervious
- C) Subject to excessive shrinkage
- D) Heavy and dark

Correct Answer:* A) Brittle and lose cohesion

Explanation: While silica prevents warping, too much of it destroys the bonding between particles, making bricks fragile.

Q4. Fat lime is obtained by the calcination of:

- A) Kankar
- B) Pure limestone
- C) Argillaceous limestone
- D) Dolomite

Correct Answer: B) Pure limestone

Explanation: Fat lime contains more than 95% calcium oxide and slakes vigorously with a large volume increase.

Q5. The specific gravity of cement is generally taken as:

- A) 2.55
- B) 2.85
- C) 3.15
- D) 3.45

Correct Answer: C) 3.15

Explanation: Specific gravity is evaluated using a Le-Chatelier flask with kerosene; for OPC it is typically around 3.15.

Q6. The "frog" of a brick is provided to:

- A) Reduce brick weight
- B) Provide a keyed joint for mortar
- C) Improve aesthetic appearance
- D) Assist in oven drying

Correct Answer: B) Provide a keyed joint for mortar

Explanation: The depression (frog) creates a mechanical lock between successive courses of masonry via mortar.

Q7. Bulking of sand is maximum at a moisture content of approximately:

- A) 2%
- B) 5% to 8%
- C) 15%
- D) 20%

Explanation: Surface tension of moisture films pushes sand grains apart, peaking around 5-8% moisture content.

Q8. Seasoning of timber is done primarily to:

- A) Increase its density
- B) Remove moisture from sap cells
- C) Make it completely fireproof
- D) Enhance its dark color

Correct Answer: B) Remove moisture from sap cells

Explanation: Proper seasoning minimizes dimensional changes, warping, and fungal decay by reducing moisture content.

Q9. Plastering coat that provides a smooth, final finish is called the:

- A) Blinding coat
- B) Undercoat

- C) Finishing coat
- D) Scratch coat

Correct Answer: C) Finishing coat

Explanation: The final coat uses fine-grained lime or POP to deliver a smooth aesthetic surface over the undercoat.

Q10. The decay of timber caused by the attack of fungi is characterized by:

- A) Increased weight
- B) Dry or wet rot with loss of strength
- C) High resistance to compression
- D) Deep black coloration only

Correct Answer: B) Dry or wet rot with loss of strength

Explanation: Fungi consume wood cellulose/lignin, resulting in structural disintegration known as timber rot.

2. Surveying

Q11. The length of a standard Engineer's Chain is:

- A) 33 feet
- B) 66 feet
- C) 100 feet
- D) 100 meters

Correct Answer: C) 100 feet

Explanation: An Engineer's chain is 100 feet long with 100 links; Gunter's chain is 66 feet long.

Q12. Correction for sag applied to a chain or tape measurement is always:

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

Correct Answer: B) Negative

Explanation: Sagging creates an arc-like path that overestimates the linear distance between points, requiring a subtraction (negative correction).

Q13. The angle between the true meridian and the magnetic meridian is called:

- A) Azimuth
- B) Declination
- C) Bearing
- D) Dip

Correct Answer: B) Declination

Explanation: Magnetic declination varies with location and time, shifting the magnetic needle away from true geographic north.

Q14. The sum of interior angles of a closed traverse with n sides should equal:

- A) $(n - 2) \times 180^\circ$
- B) $(2n - 4) \times 90^\circ$
- C) Both A and B
- D) $(n + 2) \times 180^\circ$

Correct Answer: C) Both A and B

Explanation: $(n - 2) \times 180^\circ$ mathematically simplifies to $(2n - 4) \times 90^\circ$, representing total internal angles.

Q15. Contour lines of different elevations uniting to form a single line indicate a:

- A) Valley line
- B) Ridge line
- C) Vertical cliff or overhanging cliff
- D) Uniform slope

Correct Answer: C) Vertical cliff or overhanging cliff

Explanation: When multiple contour lines converge at one point on a plan, it represents a vertical drop or cliff face.

Q16. The process of turning a telescope over its horizontal axis in a vertical plane is called:

- A) Centering
- B) Transiting / Reversing
- C) Swinging
- D) Leveling

Correct Answer: B) Transiting / Reversing

Explanation: Transiting brings the eyepiece to the front and the objective lens to the back in a theodolite.

Q17. In plane tabling, orientation of the board is best performed by:

- A) Magnetic needle
- B) Back reckoning
- C) Resection
- D) Both A and B

Correct Answer: D) Both A and B

Explanation: Orientation ensures the table remains parallel to its position at previous stations using a compass or back sighting.

Q18. The combined correction for curvature and refraction in leveling is:

- A) $-0.06735D^2$
- B) $+0.06735D^2$
- C) $-0.0785D^2$
- D) Zero

Correct Answer: A) $-0.06735D^2$

Explanation: Curvature correction is negative and refraction is positive; combined net effect is $-0.06735D^2$ (with D in km).

Q19. The last reading taken from any leveling setup before moving the instrument is a:

- A) Backsight
- B) Foresight
- C) Intermediate sight
- D) Change point

Correct Answer: B) Foresight

Explanation: Foresight denotes the final staff reading on a point of unknown elevation.

Q20. The sensitivity of a bubble tube in a level is directly proportional to the:

- A) Radius of curvature of the tube
- B) Length of the bubble
- C) Viscosity of the liquid inside
- D) Diameter of the tube

Correct Answer: A) Radius of curvature of the tube

Explanation: A larger radius of curvature makes the bubble move further per unit tilt, increasing sensitivity.

3. Strength of Materials (SOM)

Q21. Hooke's law states that stress is proportional to strain up to:

- A) Ultimate point
- B) Yield point
- C) Proportional limit
- D) Breaking point

Correct Answer: C) Proportional limit

Explanation: Within the proportional limit, linear elasticity holds and stress-strain graphs maintain a straight line.

Q22. Poisson's ratio is defined as the ratio of:

- A) Longitudinal strain to lateral strain
- B) Lateral strain to longitudinal strain
- C) Shear strain to linear strain
- D) Volumetric strain to linear strain

Correct Answer: B) Lateral strain to longitudinal strain

Explanation: Poisson's ratio (μ) measures transverse contraction/expansion relative to axial extension/compression.

Q23. The relationship between Young's modulus (E), Shear modulus (G), and Bulk modulus (K) is:

- A) $E = \frac{9KG}{3K+G}$
- B) $E = 2G(1 + \mu)$
- C) $E = 3K(1 - 2\mu)$
- D) All of the above

Correct Answer: D) All of the above

Explanation: These elastic constants are interrelated through compatibility equations for isotropic homogeneous materials.

Q24. The maximum bending moment for a simply supported beam of span L carrying a central point load W is:

- A) $WL/2$
- B) $WL/4$
- C) $WL/8$
- D) $WL^2/8$

Correct Answer: B) $WL/4$

Explanation: For a centered point load W , maximum bending moment occurs at mid-span and equals $\frac{W \times L}{4}$.

Q25. The moment of inertia of a circular section of diameter d about its centroidal axis is:

- A) $\frac{\pi d^4}{32}$
- B) $\frac{\pi d^4}{64}$
- C) $\frac{\pi d^3}{16}$
- D) $\frac{\pi d^2}{4}$

Correct Answer: B) $\frac{\pi d^4}{64}$

Explanation: Polar moment of inertia is $\frac{\pi d^4}{32}$, whereas centroidal area moment of inertia is $\frac{\pi d^4}{64}$.

Q26. A beam of uniform strength has a constant:

- A) Cross-sectional area along span
- B) Bending stress at outer fibers along span
- C) Depth throughout

- D) Moment of inertia

Correct Answer: B) Bending stress at outer fibers along span

Explanation: In a uniform strength beam, dimensions vary such that extreme fiber stress equals allowable limits everywhere.

Q27. Principal planes are defined as planes where the:

- A) Normal stress is maximum
- B) Shear stress is zero
- C) Normal stress is zero
- D) Shear stress is maximum

Correct Answer: B) Shear stress is zero

Explanation: On principal planes, direct normal stresses reach extreme values and associated shear stress components vanish.

Q28. Maximum torsional shear stress in a circular solid shaft subjected to a twisting moment occurs at the:

- A) Center axis
- B) Outer surface
- C) Mid-radius point
- D) Uniform across cross-section

Correct Answer: B) Outer surface

Explanation: Torsional shear stress varies linearly from zero at the center to a maximum value at the outermost radius.

Q29. The maximum deflection of a cantilever beam of length L carrying a point load W at its free end is:

- A) $\frac{WL^3}{3EI}$
- B) $\frac{WL^3}{8EI}$
- C) $\frac{5WL^4}{384EI}$
- D) $\frac{WL^3}{48EI}$

Correct Answer: A) $\frac{WL^3}{3EI}$

Explanation: Integration of moment-curvature relations for a cantilever under free-end point load yields $\delta_{max} = \frac{WL^3}{3EI}$.

Q30. Resilience refers to the capacity of a material to:

- A) Absorb energy up to the elastic limit
- B) Resist plastic deformation
- C) Withstand sudden impact failures

- D) Absorb energy up to fracture point

Correct Answer: A) Absorb energy up to the elastic limit

Explanation: Modulus of resilience represents strain energy stored per unit volume within the elastic regime.

4. Concrete Technology & RCC Structures

Q31. The minimum grade of concrete recommended for reinforced concrete structures as per IS 456 is:

- A) M10
- B) M15
- C) M20
- D) M25

Correct Answer: C) M20

Explanation: IS 456-2000 specifies M20 as the baseline minimum grade for structural reinforced concrete design.

Q32. Short-term static modulus of elasticity of concrete (E_c) can be estimated as:

- A) $5000\sqrt{f_{ck}}$
- B) $500\sqrt{f_{ck}}$
- C) $1000f_{ck}$
- D) $57000\sqrt{f_{ck}}$

Correct Answer: A) $5000\sqrt{f_{ck}}$

Explanation: IS 456 defines dynamic/static empirical modulus relationship using characteristic compressive strength f_{ck} as $E_c = 5000\sqrt{f_{ck}}$.

Q33. Transverse stirrups provided in RCC beams are primarily designed to resist:

- A) Bending moment
- B) Torsional moment only
- C) Shear force
- D) Axial compression

Correct Answer: C) Shear force

Explanation: Stirrups act as vertical tension members that bridge diagonal tension cracks caused by shear force.

Q34. The development length (L_d) of a reinforcing bar is given by the formula:

- A) $\frac{\phi\sigma_s}{4\tau_{bd}}$
- B) $\frac{\phi\sigma_s}{2\tau_{bd}}$
- C) $\frac{\tau_{bd}}{4\phi\sigma_s}$

- D) $\frac{2\phi\sigma_s}{\tau_{bd}}$

Correct Answer: A) $\frac{\phi\sigma_s}{4\tau_{bd}}$

Explanation: Development length ensures bar anchorage security, balancing bond stress τ_{bd} against tensile steel stress σ_s .

Q35. The maximum area of tension reinforcement in an RCC beam shall not exceed:

- A) 1% of gross area
- B) 2% of gross area
- C) 4% of gross area
- D) 6% of gross area

Correct Answer: C) 4% of gross area

Explanation: IS 456 limits maximum tension steel to 4% of total cross-sectional area to avoid congestion and ensure proper concrete consolidation.

Q36. The limiting neutral axis depth factor ($x_{u,max}/d$) for Fe 415 grade steel in limit state design is:

- A) 0.53
- B) 0.48
- C) 0.46
- D) 0.36

Correct Answer: B) 0.48

Explanation: Calculated using strain compatibility where steel yield strain corresponds to $\frac{0.87f_y}{E_s} + 0.002$.

Q37. Workability of fresh concrete on site is most commonly measured using the:

- A) Vicat needle test
- B) Slump cone test
- C) Le-Chatelier test
- D) Los Angeles test

Correct Answer: B) Slump cone test

Explanation: Slump test measures consistency and flowability by recording vertical subsidence of a frustum cone sample.

Q38. Minimum percentage of tension reinforcement (A_{st}) in a beam is computed as:

- A) $\frac{0.85}{f_y}bd$
- B) $\frac{0.4}{f_y}bd$
- C) $\frac{1.2}{f_y}bd$

- D) $0.04bd$

Explanation: IS 456 specifies $\frac{A_{st}}{bd} = \frac{0.85}{f_y}$ to prevent sudden brittle failure upon concrete cracking.

Q39. Curing of concrete is essential to maintain moisture for:

- A) Cement hydration
- B) Drying out excess water quickly
- C) Preventing formwork adhesion
- D) Increasing aggregate hardness

Correct Answer: A) Cement hydration

Explanation: Continuous hydration creates calcium silicate hydrate gel, which builds strength and impermeability.

Q40. Segregation in concrete occurs when:

- A) Coarse aggregates separate from the mortar matrix
- B) Cement floats to the surface
- C) Water evaporates too quickly
- D) Reinforcement bars shift positions

Correct Answer: A) Coarse aggregates separate from the mortar matrix

Explanation: Excessive dropping height or high water-cement ratio causes heavy aggregates to settle, breaking mix uniformity.

5. Steel Structures

Q41. The maximum permissible bending stress in structural steel sections is generally taken as:

- A) $0.40f_y$
- B) $0.60f_y$
- C) $0.66f_y$
- D) $0.80f_y$

Correct Answer: C) $0.66f_y$

Explanation: Under working stress design principles, permissible bending stress is limited to 0.66 times yield stress f_y .

Q42. Effective length of a fillet weld is taken as the total length minus:

- A) One weld size
- B) Two times the weld size
- C) Four times the weld size
- D) Zero

Correct Answer: B) Two times the weld size

Explanation: Terminal craters at the start and end of a fillet weld are assumed ineffective, so $2 \times s$ is deducted.

Q43. The maximum slenderness ratio for a tension member in which reversal of stress occurs due to loads other than wind is:

- A) 180
- B) 250
- C) 350
- D) 400

Correct Answer: A) 180

Explanation: IS 800 restricts slenderness to 180 for tension members experiencing stress reversals to prevent buckling under compression.

Q44. The Indian Standard code of practice for general construction in steel is:

- A) IS 456
- B) IS 800
- C) IS 875
- D) IS 1893

Correct Answer: B) IS 800

Explanation: IS 800 governs working stress and limit state design requirements for structural steelwork.

Q45. Minimum pitch of bolts in a bolted connection shall not be less than:

- A) $1.5 \times \text{nominal diameter}$
- B) $2.5 \times \text{nominal diameter}$
- C) $3.0 \times \text{nominal diameter}$
- D) $5.0 \times \text{nominal diameter}$

Explanation: A minimum pitch of $2.5d$ ensures adequate spacing between bolt holes to prevent tearing of plates.

Q46. Web buckling in plate girders under heavy shear is prevented by providing:

- A) Bearing plates
- B) Intermediate vertical stiffeners
- C) Flange angles
- D) Base plates

Correct Answer: B) Intermediate vertical stiffeners

Explanation: Stiffeners divide the thin web panel into smaller segments, increasing resistance against diagonal buckling.

Q47. The shape factor for a rectangular steel cross-section in bending is:

- A) 1.0

- B) 1.15
- C) 1.50
- D) 1.70

Correct Answer: C) 1.50

Explanation: Shape factor ($S = Z_p/Z_e$) represents the ratio of plastic modulus to elastic section modulus for rectangles.

Q48. Plastic modulus (Z_p) of a section is defined as the:

- A) Moment of inertia about neutral axis
- B) First moment of area about the plastic neutral axis
- C) Elastic section modulus multiplied by yield stress
- D) Radius of gyration squared

Correct Answer: B) First moment of area about the plastic neutral axis

Explanation: The plastic neutral axis divides the total cross-sectional area into two equal halves, with $Z_p = A_1y_1 + A_2y_2$.

Q49. Eccentric connections loaded in-plane induce:

- A) Direct shear only
- B) Direct tension only
- C) Direct shear and torsional/moment effects
- D) Bending compression only

Correct Answer: C) Direct shear and torsional/moment effects

Explanation: Eccentricity creates an equivalent turning moment combined with primary direct shear forces across fasteners.

Q50. Economical spacing of roof trusses depends on the comparative cost of:

- A) Foundation versus walls
- B) Purlins versus roof trusses
- C) Bracing versus sheeting
- D) Steel grade versus concrete grade

Correct Answer: B) Purlins versus roof trusses

Explanation: Spacing is optimized when the cost of roof purlins equals the cost of the main trusses.

6. Soil Mechanics & Geotechnical Engineering

Q51. Void ratio (e) of a soil mass is defined as the ratio of:

- A) Volume of voids to total volume
- B) Volume of voids to volume of solids
- C) Volume of water to volume of voids
- D) Weight of water to weight of solids

Correct Answer: B) Volume of voids to volume of solids

Explanation: Void ratio ($e = V_v/V_s$) relates pore space directly to soil skeleton solid volume.

Q52. The degree of saturation for a completely dry soil sample is equal to:

- A) 0%
- B) 50%
- C) 100%
- D) Variable

Correct Answer: A) 0%

Explanation: Zero moisture in voids means zero saturation ($S = V_w/V_v = 0$).

Q53. The fundamental three-phase relationship connecting void ratio (e), water content (w), specific gravity (G), and degree of saturation (S) is:

- A) $Se = wG$
- B) $eS = w/G$
- C) $w = eS/G$
- D) $G = se/w$

Correct Answer: A) $Se = wG$

Explanation: This core identity links phase weights and volumes in soil mechanics.

Q54. Sedimentation analysis (pipette or hydrometer method) is used to determine particle size distribution of:

- A) Gravels
- B) Coarse sands
- C) Fine-grained soils (silts and clays)
- D) Compacted rocks

Correct Answer: C) Fine-grained soils (silts and clays)

Explanation: Stokes' law governs particle settling velocities in water suspensions for particle sizes finer than $0.075mm$.

Q55. Liquid limit of a soil is determined in the laboratory using:

- A) Pycnometer
- B) Casagrande's apparatus
- C) Shear box
- D) Permeameter

Correct Answer: B) Casagrande's apparatus

Explanation: The Casagrande cup measures moisture content at which a standard groove closes after 25 drops.

Q56. Darcy's law for fluid flow through porous soils is valid when the flow is:

- A) Turbulent

- B) Laminar
- C) Transitional
- D) Unsteady

Correct Answer: B) Laminar

Explanation: Darcy's law assumes linear proportionality between velocity and hydraulic gradient, valid only for laminar flow regimes.

Q57. The coefficient of volume compressibility (m_v) is defined as:

- A) Change in volume per unit initial volume per unit increase in effective stress
- B) Void ratio change per unit pressure
- C) Permeability divided by unit weight
- D) Compression index divided by initial void ratio

Correct Answer: A) Change in volume per unit initial volume per unit increase in effective stress

Explanation: $m_v = \frac{a_v}{1+e_0}$, representing compressibility per unit effective stress increment.

Q58. Ultimate bearing capacity of a shallow foundation depends primarily on:

- A) Foundation width, depth, and soil shear strength parameters (c, ϕ)
- B) Color of soil particles
- C) Total depth of groundwater table below base only
- D) Ambient temperature fluctuations

Correct Answer: A) Foundation width, depth, and soil shear strength parameters (c, ϕ)

Explanation: Terzaghi and Meyerhof bearing capacity equations incorporate cohesion, surcharge depth, and footing dimensions.

Q59. Laboratory compaction of soils primarily increases:

- A) Degree of saturation
- B) Dry density
- C) Permeability coefficient
- D) Void ratio

Correct Answer: B) Dry density

Explanation: Compaction expels air voids from the soil matrix, packing particles closer together to increase dry unit weight.

Q60. The active earth pressure coefficient (K_a) for a smooth vertical retaining wall with horizontal backfill is given by:

- A) $\frac{1+\sin\phi}{1-\sin\phi}$
- B) $\frac{1-\sin\phi}{1+\sin\phi}$
- C) $\tan^2 (45^\circ - \phi)$

- D) Both B and C

Correct Answer: D) Both B and C

Explanation: Rankine's active pressure coefficient is expressed as $\frac{1-\sin\phi}{1+\sin\phi}$, which equals $\tan^2 (45^\circ - \phi/2)$.

7. Fluid Mechanics & Hydraulics

Q61. The unit of dynamic viscosity in SI units is:

- A) $N \cdots / m^2$ (or $Pa \cdots$)
- B) m^2/s
- C) kg/m^3
- D) N/m

Correct Answer: A) $N \cdots / m^2$ (or $Pa \cdots$)

Explanation: Dynamic viscosity measures fluid shear resistance; kinematic viscosity is expressed in m^2/s .

Q62. Pascal's law states that pressure at any point in a fluid at rest is:

- A) Higher at the bottom than the top
- B) Equal in all directions
- C) Dependent on container geometry
- D) Equal to atmospheric pressure

Correct Answer: B) Equal in all directions

Explanation: Static fluid pressure exerts equal magnitude force normal to any surface passing through that point.

Q63. The center of pressure for a vertical submerged plane surface always lies:

- A) Above the center of gravity
- B) Below the center of gravity
- C) Exactly at the center of gravity
- D) At the free liquid surface

Correct Answer: B) Below the center of gravity

Explanation: Because fluid pressure increases linearly with depth, the resultant center of pressure shifts downward from the centroid.

Q64. Metacentric height is defined as the distance between the center of gravity of a floating body and its:

- A) Center of buoyancy
- B) Metacenter
- C) Center of pressure
- D) Waterline

Correct Answer: B) Metacenter

Explanation: Metacentric height (GM) governs rotational stability; positive GM indicates stable equilibrium.

Q65. Euler's equation of motion for ideal fluids assumes that the fluid is:

- A) Viscous and compressible
- B) Non-viscous (inviscid) and incompressible
- C) Turbulent and rotational
- D) Static

Correct Answer: B) Non-viscous (inviscid) and incompressible

Explanation: Euler's equation considers pressure, gravity, and inertial forces, ignoring viscous shear losses.

Q66. The Reynolds number threshold marking the transition from laminar to turbulent flow in circular pipes is approximately:

- A) 500
- B) 2000 to 4000
- C) 10000
- D) 50000

Explanation: Pipe flow remains laminar below $Re \approx 2000$ and transitions to fully turbulent above $Re \approx 4000$.

Q67. The Hydraulic Gradient Line (HGL) represents the sum of:

- A) Pressure head and velocity head
- B) Potential head and velocity head
- C) Pressure head and potential (datum) head
- D) Total energy head

Correct Answer: C) Pressure head and potential (datum) head

Explanation: HGL plots elevation plus piezometric pressure head, dropping along pipelines due to friction head loss.

Q68. Specific energy in an open channel flow is defined as energy per unit weight measured with respect to the:

- A) Hydraulic grade line
- B) Channel bottom
- C) Water surface
- D) Datum line

Correct Answer: B) Channel bottom

Explanation: Specific energy $E = y + \frac{v^2}{2g}$, taking channel bed elevation as the local reference datum.

Q69. Critical depth (y_c) in a rectangular open channel carrying discharge q per unit width is:

- A) $\left(\frac{q^2}{g}\right)^{1/3}$
- B) $\left(\frac{q}{g}\right)^{1/2}$
- C) $\frac{v^2}{2g}$
- D) $\frac{Q^2}{gA^3}$

Correct Answer: A) $\left(\frac{q^2}{g}\right)^{1/3}$

Explanation: Critical flow condition occurs when Froude number equals unity, giving minimum specific energy at depth $y_c = (q^2/g)^{1/3}$.

Q70. Centrifugal pumps operate on the principle of:

- A) Displacement of fluid volumes
- B) Forced vortex flow converting mechanical energy to pressure energy
- C) Gravity flow acceleration
- D) Jet momentum exchange

Correct Answer: B) Forced vortex flow converting mechanical energy to pressure energy

Explanation: Impellers impart high rotational velocity to water, which volute casings subsequently convert into static pressure head.

8. Environmental Engineering

Q71. Standard per capita domestic water demand in India as per IS 1172 for towns with flushing systems is:

- A) 70 lpcd
- B) 135 lpcd
- C) 200 lpcd
- D) 270 lpcd

Correct Answer: B) 135 lpcd

Explanation: IS 1172 recommends 135 liters per capita per day (lpcd) for residences equipped with full flushing water installations.

Q72. The design period for major water treatment units (like sedimentation tanks and filters) is generally:

- A) 5 to 10 years
- B) 15 to 20 years
- C) 30 years
- D) 50 years

Correct Answer: C) 30 years

Explanation: Treatment plants are designed for a 30-year horizon to balance initial capital investment with future population growth.

Q73. Disinfection of public drinking water is carried out primarily to:

- A) Remove turbidity and color
- B) Destroy pathogenic disease-causing microorganisms
- C) Adjust pH balance
- D) Add minerals

Correct Answer: B) Destroy pathogenic disease-causing microorganisms

Explanation: Chlorination or UV disinfection inactivates harmful bacteria and viruses remaining after filtration.

Q74. The most common chemical coagulant used in water treatment sedimentation is:

- A) Sodium chloride
- B) Alum (Aluminium sulphate)
- C) Copper sulphate
- D) Bleaching powder

Correct Answer: B) Alum (Aluminium sulphate)

Explanation: Alum hydrolyzes in water to form a sticky aluminum hydroxide floc that traps and settles suspended colloids.

Q75. Biochemical Oxygen Demand (BOD) test standard incubation period and temperature are:

- A) 3 days at 27°C
- B) 5 days at 20°C
- C) 10 days at 37°C
- D) 1 day at 100°C

Correct Answer: B) 5 days at 20°C

Explanation: Standard BOD_5 measures oxygen consumed by microbial decomposition over 5 days in a dark incubator at 20°C .

Q76. Sludge digestion in wastewater treatment is performed to:

- A) Increase pathogen count
- B) Stabilize organic matter and reduce sludge volume
- C) Make sludge acidic
- D) Liquefy inorganic grit

Correct Answer: B) Stabilize organic matter and reduce sludge volume

Explanation: Anaerobic or aerobic digestion breaks down volatile organics, producing odorless, easily dewatered sludge.

Q77. Self-cleansing velocity in sanitary sewers is necessary to prevent:

- A) Pipe corrosion
- B) Deposition and sedimentation of solid particles
- C) High pressure surges
- D) Hydraulic jumps

Correct Answer: B) Deposition and sedimentation of solid particles

Explanation: Maintaining minimum velocities (typically 0.8 to 1.0m/s) prevents solids from settling and clogging sewers.

Q78. Atmospheric plume behavior characterized by super-adiabatic environmental lapse rates causing rapid vertical mixing is called:

- A) Fumigation
- B) Looping
- C) Coning
- D) Fanning

Correct Answer: B) Looping

Explanation: Unstable atmospheric conditions create wavy, oscillating pollutant plumes known as looping.

Q79. The Most Probable Number (MPN) test is conducted to detect the presence of:

- A) Heavy metals
- B) Coliform bacteria (Indicator organisms)
- C) Dissolved oxygen
- D) Nitrate compounds

Correct Answer: B) Coliform bacteria (Indicator organisms)

Explanation: MPN statistical estimation tests for *E. coli* or coliform bacteria to check water bacteriological safety.

Q80. Extended aeration activated sludge processes are operated at a:

- A) High F/M ratio and low sludge age
- B) Low Food-to-Microorganism (F/M) ratio and long sludge age
- C) High organic loading rate
- D) Zero sludge return rate

Correct Answer: B) Low Food-to-Microorganism (F/M) ratio and long sludge age

Explanation: Extended aeration operates with prolonged biomass retention, producing well-stabilized, mineralized sludge with minimal excess waste.

9. Transportation Engineering (Highway/Railway)

Q81. Stopping Sight Distance (SSD) on a highway depends upon:

- A) Driver reaction time and vehicle speed
- B) Braking efficiency and longitudinal friction coefficient
- C) Road gradient

- D) All of the above

Correct Answer: D) All of the above

Explanation: SSD equals the sum of lag distance (reaction time) and braking distance, both governed by speed, grade, and friction.

Q82. Extra widening of highways on horizontal curves is provided to account for:

- A) Off-tracking of rear wheels and psychological safety
- B) High wind loads
- C) Drainage requirements
- D) Pavement surface texture

Correct Answer: A) Off-tracking of rear wheels and psychological safety

Explanation: Multi-axle vehicles require additional pavement width on curves due to tracking offsets and driver comfort margins.

Q83. Camber is provided on highway pavements primarily to:

- A) Increase vehicle speed
- B) Drain off surface rainwater quickly
- C) Improve aesthetic appeal
- D) Reduce rolling resistance

Correct Answer: B) Drain off surface rainwater quickly

Explanation: Transverse slope (camber) sheds rainwater toward shoulders, preventing water pooling and hydroplaning.

Q84. California Bearing Ratio (CBR) test results are used directly in the design of:

- A) Bridge piers
- B) Flexible highway pavements
- C) Retaining walls
- D) Railway ballast

Correct Answer: B) Flexible highway pavements

Explanation: CBR values evaluate subgrade soil strength to determine subbase and base course layer thicknesses.

Q85. Bitumen grade 80/100 signifies that the penetration value of the bitumen at 25°C lies between:

- A) 0.08mm and 0.10mm
- B) 8mm and 10mm
- C) 8mm and 10mm (wait, penetration units are in tenths of a mm: 8mm to 10mm? Let's check: penetration is measured in 0.1mm units, so 80 – 100tenths of mm = 8mm to 10mm penetration depth).

Explanation: Penetration tests measure needle indentation in tenths of a millimeter over 5 seconds under a 100g load.

Q86. Flash and fire points of bituminous binders are determined using the:

- A) Cleveland open cup apparatus
- B) Ring and ball apparatus
- C) Ductility testing machine
- D) Benkelman beam

Correct Answer: A) Cleveland open cup apparatus

Explanation: Cleveland open cup tests determine safe heating temperatures without fire hazards during paving operations.

Q87. Ruling gradient in railway engineering is defined as the:

- A) Maximum gradient permissible on a track where locomotives can haul loads without auxiliary engines
- B) Steepest grade on sidings
- C) Gradient used exclusively in stations
- D) Minimum track slope

Correct Answer: A) Maximum gradient permissible on a track where locomotives can haul loads without auxiliary engines

Explanation: Ruling gradients establish locomotive hauling capacity limits across sections without requiring helper engines.

Q88. Sleepers are placed beneath railway rails to:

- A) Transfer loads to the ballast bed and maintain track gauge
- B) Absorb all vibrations permanently
- C) Support overhead electrical cables
- D) Anchor trains during braking

Correct Answer: A) Transfer loads to the ballast bed and maintain track gauge

Explanation: Sleepers distribute wheel loads evenly across ballast cushions while holding rail alignments parallel.

Q89. A diamond crossing occurs when two railway tracks:

- A) Merge into a single track
- B) Cross each other at grade level without connecting switches
- C) Run parallel on an embankment
- D) Diverge into yards

Correct Answer: B) Cross each other at grade level without connecting switches

Explanation: Diamond crossings allow trains on intersecting tracks to cross at grade without permitting track-to-track transitions.

Q90. Cant deficiency on railway curves occurs when a train travels at a speed:

- A) Lower than equilibrium speed
- B) Higher than the equilibrium design speed for the provided cant

- C) Equal to zero
- D) Exactly at maximum speed limit

Correct Answer: B) Higher than the equilibrium speed for the provided cant

Explanation: Cant deficiency represents uncompensated centrifugal force experienced when trains run faster than the design cant speed.

10. Estimating, Costing & Valuation

Q91. A detailed estimate of a civil engineering project is prepared when:

- A) Preliminary estimates are approved and administrative approval is secured
- B) Construction is half-completed
- C) Land acquisition is pending
- D) Project planning starts

Correct Answer: A) Preliminary estimates are approved and administrative approval is secured

Explanation: Detailed estimates itemize quantities and rates using sanctioned architectural/structural drawings after administrative clearance.

Q92. Contingencies added to a detailed construction estimate usually account for incidental expenses at:

- A) 1%
- B) 3% to 5%
- C) 10% to 15%
- D) 20%

Correct Answer: B) 3% to 5%

Explanation: Contingency provisions (typically 3% to 5% of estimated project costs) cover minor unforeseen miscellaneous expenses.

Q93. The unit of measurement for brickwork in arches is in terms of:

- A) Square meters (m^2)
- B) Cubic meters (m^3)
- C) Running meters (m)
- D) Number of bricks

Correct Answer: B) Cubic meters (m^3)

Explanation: Standard brickwork—including arches, walls, and foundations—is measured by volume in cubic meters (m^3).

Q94. Deductions for masonry wall openings for doors and windows are ignored in estimation if individual opening areas do not exceed:

- A) $0.05m^2$
- B) $0.1m^2$
- C) $0.5m^2$

- D) $1.0m^2$

Explanation: IS rules omit opening deductions up to $0.1m^2$ to save calculation time since edge plastering work balances out.

Q95. Depreciation of a building over time is commonly calculated using the:

- A) Straight line method
- B) Sinking fund method
- C) Constant percentage method
- D) All of the above

Correct Answer: D) All of the above

Explanation: Valuers use multiple standard techniques like straight-line or declining-balance methods to estimate present property worth.

Q96. The cost of earthwork excavation in ordinary soil up to a lead of 30m and lift of 1.5m is measured in:

- A) Square meters (m^2)
- B) Cubic meters (m^3)
- C) Quintals
- D) Lump sum

Correct Answer: B) Cubic meters (m^3)

Explanation: Bulk earthwork operations are quantified volumetrically based on cross-sectional profile calculations.

Q97. A plinth area estimate is classified as which type of estimate?

- A) Detailed estimate
- B) Approximate or preliminary estimate
- C) Revised estimate
- D) Completion estimate

Correct Answer: B) Approximate or preliminary estimate

Explanation: Plinth area estimates use building footprint area multiplied by prevailing unit plinth area rates for initial budget approximations.

Q98. Scrap value of a building at the end of its utility period is usually assumed to be approximately:

- A) 2% of original cost
- B) 10% of total construction cost
- C) 50% of original cost
- D) Zero

Correct Answer: B) 10% of total construction cost

Explanation: Scrap value represents anticipated salvage value of dismantled construction materials, commonly taken as 10%.

Q99. Capitalized value of a property is computed as the product of net annual income and the:

- A) Depreciation rate
- B) Year's purchase (YP) multiplier
- C) Sinking fund factor
- D) Plinth area rate

Correct Answer: B) Year's purchase (YP) multiplier

Explanation: Capitalized value equals net annual rent multiplied by Year's Purchase ($YP = 1/\text{interest rate}$).

Q100. The standard unit of measurement for steel reinforcement bars (including cutting, bending, and placing) is:

- A) Square meters (m^2)
- B) Cubic meters (m^3)
- C) Kilograms or tonnes (kg or T)
- D) Running meters (m)

Correct Answer: C) Kilograms or tonnes (kg or T)

Explanation: Reinforcement steel is purchased, measured, and billed by weight in kilograms or metric tonnes