

Tracer (Soil Survey and Soil Conservation)

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Detailed Explanations

Q1. Length of scale for R.F 1:30, metres & decimetres, up to 6m

Correct Answer: B

Explanation: Length of scale = R.F. $\times$ maximum distance to be measured = $(1/30) \times 6 \text{ m} = 0.2 \text{ m} = 20 \text{ cm}$.

Q2. Tangent plane & section plane meeting line (conic sections)

Correct Answer: C

Explanation: By Dandelin's sphere theorem, the line where the cutting (section) plane meets the tangent plane of the cone (at the point of tangency of the inscribed sphere) is the directrix of the conic.

Q3. Top view a point, true length in VP – line condition

Correct Answer: A

Explanation: If the top view of a line is a point, the line is perpendicular to HP. Such a line is then parallel to VP, so its true length is seen in the front view (VP).

Q4. Polygon base + isosceles triangular lateral faces

Correct Answer: D

Explanation: A solid with a polygonal base and isosceles triangular lateral faces (equal to the number of sides of the base) meeting at an apex is a pyramid.

Q5. Line AB (1st quadrant) – top view distance from XY

Correct Answer: D

Explanation: Distance in front of VP is represented in the top view (plan), drawn below the XY reference line. Since AB is 20 mm in front of VP throughout (parallel to VP), its top view lies 20 mm below the reference line.

Q6. Sum of interior angles of a regular pentagon

Correct Answer: A

Explanation: Sum of interior angles of a polygon = $(n - 2) \times 180^\circ$. For a pentagon, $n = 5$, so sum = $3 \times 180^\circ = 540^\circ$.

Q7. IS 10711:2011 – drawing sheet sizes statements

Correct Answer: D

Explanation: As per IS 10711:2011: trimmed A1 = $594 \times 841 \text{ mm}$ (not 420×594 , which is A2) – (i) false. Trimmed A2 area = $0.420 \times 0.594 \approx 0.25 \text{ m}^2$, not 0.5 m^2 – (ii) false. Untrimmed A3 = $330 \times 450 \text{ mm}$ – (iii) true. Hence only (iii) is correct.

Q8. Continuous thin lines beyond dimension lines, perpendicular

Correct Answer: B

Explanation: Projection (extension) lines are continuous thin lines drawn slightly beyond the dimension line and perpendicular to the feature being dimensioned, used to indicate the extent of a dimension.

Q9. Area of circle, circumference = $10\pi \text{ cm}$

Correct Answer: C

Explanation: Circumference = $2\pi r = 10\pi \Rightarrow r = 5 \text{ cm}$. Area = $\pi r^2 = \pi(5)^2 = 25\pi \text{ cm}^2$.

Q10. Volume of square pyramid, base 10cm, height 15cm

Correct Answer: D

Explanation: Volume of a pyramid = $(1/3) \times \text{base area} \times \text{height} = (1/3) \times (10 \times 10) \times 15 = (1/3) \times 100 \times 15 = 500 \text{ cm}^3$.

Q11. SI unit of intensity of light

Correct Answer: C

Explanation: Candela is the SI base unit for luminous intensity.

Q12. Force for 1 m/s^2 acceleration on 1 kg mass

Correct Answer: C

Explanation: By Newton's second law, $F = ma$. A force producing 1 m/s^2 acceleration in a 1 kg mass equals 1 Newton ($1 \text{ N} = 1 \text{ kg} \cdot \text{m/s}^2$).

Q13. Millimetres in one inch

Correct Answer: B

Explanation: 1 inch is defined as exactly 25.4 millimetres.

Q14. Highest DPI to print a drawing

Correct Answer: D

Explanation: For engineering line drawings, 1200 dpi is generally regarded as the practical maximum useful print resolution; beyond this, no visible improvement is achieved for typical drawing output.

Q15. Determines enlargement/reduction of diagram in CADD

Correct Answer: A

Explanation: The scale factor determines the ratio by which a diagram/drawing is enlarged or reduced when plotted in CADD.

Q16. Shortcut key 'M Text'

Correct Answer: C

Explanation: The shortcut 'MT' (or 'T') invokes the Multiline Text (Mtext) command in AutoCAD.

Q17. Shortcut key for Ortho

Correct Answer: C

Explanation: F8 toggles Ortho mode on/off in AutoCAD, restricting cursor movement to horizontal/vertical directions.

Q18. Commands for modifying existing drawing

Correct Answer: D

Explanation: Modifying commands (such as Move, Copy, Trim, Extend, Fillet, etc.) are used to alter or edit an existing drawing.

Q19. AutoCAD originally introduced

Correct Answer: B

Explanation: AutoCAD was originally introduced by Autodesk in late 1982 (commonly referenced as November/December 1982), making it one of the first CAD programs for personal computers.

Q20. STRETCH command use

Correct Answer: B

Explanation: The STRETCH command moves or stretches selected objects/vertices while keeping connections to unselected parts intact, making it useful for quick alterations to a drawing.

Q21. Strap footing / Grillage foundation statements

Correct Answer: C

Explanation: Both statements are correct. A strap footing uses a rigid strap beam to connect an eccentrically loaded exterior column footing to an adjacent interior footing so as to equalize soil pressure. A grillage foundation uses tiers of steel beams (usually encased in concrete) to spread heavy column loads over weak soil without deep piling.

Q22. Peeling (plaster) / Blistering (paint) statements

Correct Answer: B

Explanation: Statement I is false – the defect described (small conical swellings from unslaked lime particles) is called 'Blowing', not 'Peeling' (peeling is the flaking off of paint/plaster in patches). Statement II correctly describes blistering in paint films.

Q23. Flying shores / Needle beams statements

Correct Answer: A

Explanation: Statement I correctly describes flying shores, used as horizontal props between parallel walls when an intermediate building is removed. Statement II is false – the description (inclined rakers at 45° providing support) actually refers to raking shores, not needle beams (needle beams are horizontal beams passed through wall openings to carry loads temporarily).

Q24. Distemper / Efflorescence statements

Correct Answer: B

Explanation: Statement I is false – distemper is a low-durability, water-based finish mainly used for interior surfaces, not exterior. Statement II correctly explains efflorescence caused by migration of soluble salts to the

wall surface.

Q25. Vicat Apparatus / Le-Chatelier test statements

Correct Answer: D

Explanation: Both statements are correct. The Vicat apparatus determines standard consistency and initial/final setting times of cement paste, and the Le Chatelier test checks soundness of cement, primarily due to unsoundness from excess free lime (and to some extent magnesia).

Q26. Smith's Test / Acid test (stones) statements

Correct Answer: C

Explanation: Statement I is false – Smith's test is actually used to detect organic impurities in sand, not frost resistance of stone. Statement II correctly describes the acid test used to detect calcium carbonate/impurities in stone.

Q27. Dry Rot / Creosoting statements

Correct Answer: A

Explanation: Both statements are correct. Dry rot is fungal decay occurring in poorly ventilated, damp conditions, reducing wood to a dry powdery mass. Creosoting is an effective preservative using coal-tar distillates, though it leaves an odour and a dark, unpaintable surface.

Q28. Full scheme: report + design + drawings + rates

Correct Answer: A

Explanation: A complete scheme comprising the technical report, design, drawings, and rate/cost estimate for a work is called a Project.

Q29. Scale range typically adopted for Site Plan

Correct Answer: B

Explanation: A site plan (showing the plot in relation to surrounding roads/features) is generally drawn to a scale of about 1 cm = 5 m to 10 m (i.e., 1:500 to 1:1000).

Q30. Unit of measurement of threading in iron

Correct Answer: A

Explanation: Screw threading dimensions (pitch, diameter, etc.) on iron/metal components are measured in millimetres (mm).

Q31. Life of rolled steel joist for iron works

Correct Answer: D

Explanation: In standard depreciation/valuation tables used for building/structural components, the useful life assumed for rolled steel joist (RSJ) work in iron construction is taken as 75 years.

Q32. Fixed % depreciation, life of structure = 75 years

Correct Answer: C

Explanation: Under the straight-line method, fixed annual depreciation % = $100 / (\text{life in years}) = 100/75 \approx 1.3\%$.

Q33. Dormitories – residential subdivision

Correct Answer: C

Explanation: As per the National Building Code classification of residential occupancy, Group A is subdivided as: A-1 Lodging/rooming houses, A-2 One/two family dwellings, A-3 Dormitories, A-4 Apartment houses. Hence dormitories fall under A-3.

Q34. Min. distance from building line, major district road

Correct Answer: B

Explanation: The minimum building setback distance prescribed from the building line of a Major District Road is 12 m.

Q35. Core extended to impervious strata – seepage control

Correct Answer: D

Explanation: The core of an earth dam is sometimes extended down to the impervious strata as a 'cut off' to intercept and control seepage through the pervious foundation.

Q36. Small regulating reservoir before penstock/turbine

Correct Answer: A

Explanation: A forebay is a small regulating/balancing reservoir provided just before the water enters the penstock or turbine in a hydro-power scheme.

Q37. Width of berm for canal in embankment

Correct Answer: B

Explanation: The width of the berm provided in a canal embankment is generally kept about 2D (twice the depth of water in the canal), to guard against piping/seepage failure.

Q38. Drain carried over irrigation canal – CD work name

Correct Answer: B

Explanation: When a natural drain is carried over (above) an irrigation canal, the cross-drainage work is called a super passage (opposite of an aqueduct, where the canal is carried over the drain).

Q39. Passage for surplus water flow in a weir

Correct Answer: B

Explanation: A spillway is the passage/structure provided in a weir or dam to safely pass surplus flood water.

Q40. Example for kharif crops

Correct Answer: A

Explanation: Kharif crops are sown with the onset of monsoon (June–July) and harvested around October. Cotton is a typical kharif crop, while wheat, barley, and potatoes are rabi (winter) crops.

Q41. Inner most part of screw thread

Correct Answer: D

Explanation: The root is the innermost part (bottom) of a screw thread, opposite to the crest, which is the outermost part.

Q42. Use of eye bolts

Correct Answer: C

Explanation: Eye bolts, having a looped/ring head, are used for lifting and transporting heavy machines or equipment using slings/hooks.

Q43. Angle of British association thread

Correct Answer: C

Explanation: The included angle of the British Association (B.A.) screw thread is 47.5° .

Q44. ISO metric thread designation on drawing

Correct Answer: C

Explanation: ISO metric threads are designated on drawings using the letter 'M' followed by the nominal diameter (e.g., M10).

Q45. Plate thickness – double V & double U butt welds

Correct Answer: D

Explanation: Double-V and double-U butt welds are generally used for thicker plates, typically above about 15 mm, since single-V/U preparation becomes impractical for very thick material.

Q46. Fastener to prevent rotation between two parts

Correct Answer: B

Explanation: A set screw is commonly used to prevent relative rotation (and sometimes axial movement) between two mating parts, such as a hub and shaft.

Q47. Not a part of a rivet

Correct Answer: D

Explanation: A rivet consists of a head, shank (body), and tail (the end that is upset/formed to create the second head). It does not have threads.

Q48. Formula of Unwin's

Correct Answer: D

Explanation: Unwin's empirical formula for the diameter of a rivet hole is $d = 6\sqrt{t}$, where t is the plate thickness in mm and d is in mm.

Q49. Main object of caulking in riveted joints

Correct Answer: D

Explanation: Caulking is done along the edges of riveted joint plates to make the joint leak-proof by pressing the edge of the plate against the other plate.

Q50. Method of development of a cube

Correct Answer: A

Explanation: A cube (a prism-like solid with parallel edges) is developed using the parallel line method, where each face is 'unrolled' as a set of parallel rectangles.

Q51. Curve: vertical cone cut by auxiliary vertical plane

Correct Answer: C

Explanation: When a (double-napped) vertical cone is cut by a plane parallel to its axis (an auxiliary vertical plane not passing through the apex), the section produced is a hyperbola.

Q52. Positive belt drive

Correct Answer: D

Explanation: A toothed (timing) belt drive is a positive drive since the teeth mesh with the pulley grooves, eliminating slip – unlike flat, V-, or ribbed belt drives which rely on friction.

Q53. Spur gear – radial distance, pitch circle to root circle

Correct Answer: A

Explanation: In a spur gear, the dedendum is the radial distance between the pitch circle and the root (dedendum) circle.

Q54. Gear drive for heavy speed reduction

Correct Answer: C

Explanation: Worm and worm gear drives are used where very high (heavy) speed reduction ratios are required in a compact arrangement.

Q55. Valve for flow in one direction only

Correct Answer: D

Explanation: A check (non-return) valve permits flow in only one direction and automatically prevents backflow.

Q56. Not an antifriction bearing

Correct Answer: A

Explanation: A split bearing is a plain (sliding/journal) bearing, not a rolling-element (antifriction) bearing, unlike needle, ball, or taper roller bearings.

Q57. Power source of a pneumatic system

Correct Answer: C

Explanation: The compressor is the power source of a pneumatic system, converting mechanical energy into compressed air energy.

Q58. Statement not correct about FRL unit

Correct Answer: D

Explanation: An FRL unit (Filter–Regulator–Lubricator) filters, regulates pressure, and lubricates compressed air downstream of the compressor; it does not affect or increase the efficiency of the compressor itself.

Q59. Plain bearing not requiring regular lubrication

Correct Answer: A

Explanation: Sintered (porous) alloy bearings are impregnated with oil during manufacture and are self-lubricating, so they do not require regular external lubrication.

Q60. Bearing with provision for wear adjustment

Correct Answer: B

Explanation: An adjustable slide (plain) bearing is designed with a provision (e.g., adjustable gib/shim) to compensate for wear and maintain proper clearance.

Q61. BIS limits & fits – max limit of size minus basic size

Correct Answer: C

Explanation: In the BIS (Indian Standard) system of limits and fits, upper deviation is defined as the algebraic difference between the maximum limit of size and the basic size.

Q62. Graphical rep. of limits & fits – zero line meaning

Correct Answer: A

Explanation: In the graphical (zero-line) representation of limits and fits, the zero line represents the basic size, from which all deviations are measured.

Q63. Correct statement about clearance fit

Correct Answer: B

Explanation: For a clearance fit, minimum clearance = minimum size of hole – maximum size of shaft, which is always a positive (clearance) value.

Q64. Actual difference – surface speed of belt & pulley

Correct Answer: B

Explanation: Slip is the actual relative movement (difference in surface speed) between the belt and the pulley due to elastic creep and friction limitations.

Q65. Belt fastener used for industrial purposes

Correct Answer: D

Explanation: The alligator-type belt fastener (a hinged metal clamp with interlocking teeth) is a common industrial belt joining fastener.

Q66. Method not used for three-point problem (plane table)

Correct Answer: D

Explanation: The three-point problem in plane table surveying is commonly solved by the tracing paper method, the graphical (Bessel's) method, the mechanical/graphical method, or the triangle of error (trial and error) method – not by triangulation, which is a separate control-survey technique.

Q67. Benchmark by local govt on permanent structure

Correct Answer: C

Explanation: A permanent benchmark (PBM) is a fixed, durable reference point established (often by a government agency) on a permanent structure, whose reduced level is known and does not change.

Q68. Horizontal equivalent zero – case of

Correct Answer: D

Explanation: On a vertical cliff, the horizontal distance between successive contour lines (horizontal equivalent) becomes zero since the face is vertical.

Q69. Error due to inclination of line of collimation

Correct Answer: A

Explanation: The error caused by inclination of the line of collimation (line of sight not being truly horizontal) is eliminated by keeping the back sight and fore sight distances equal, so the error cancels out.

Q70. Axis about which telescope rotates (vertical plane)

Correct Answer: B

Explanation: The horizontal axis (trunnion axis) is the axis about which the telescope of a level/theodolite rotates in the vertical plane.

Q71. Tape for precise baseline measurement (triangulation)

Correct Answer: C

Explanation: Invar tape, made of a nickel-steel alloy with a very low coefficient of thermal expansion, is used to precisely measure the baseline in triangulation surveys.

Q72. Angle of index glass of optical square to index sight

Correct Answer: A

Explanation: The index glass (mirror) of an optical square is fixed at 45° to the line of sight (index sight), enabling it to turn the line of sight through 90° by double reflection.

Q73. True meridian through various stations

Correct Answer: C

Explanation: True meridians are great circles passing through the north and south poles, so they converge towards the poles (they are not parallel to each other, except at the equator).

Q74. Principle of tacheometry based on property of

Correct Answer: D

Explanation: The principle of tacheometry is based on the property of an isosceles triangle formed by the two stadia hairs and the staff intercept, which maintains a constant apex (vertical) angle.

Q75. Simpson's rule – boundary between ordinates

Correct Answer: A

Explanation: Simpson's rule assumes that the boundary between the ordinates is a parabolic arc (hence also called the parabolic rule).

Q76. Cross sectional area of embankment (10m, 2:1, h=2.5m)

Correct Answer: A

Explanation: Cross-sectional area of embankment with level ground = $b \cdot h + s \cdot h^2$, where b = top width = 10 m, s = side slope = 2 (2:1), h = central height = 2.5 m. Area = $(10 \times 2.5) + (2 \times 2.5^2) = 25 + 12.5 = 37.5 \text{ m}^2$.

Q77. GPS constellation – no. of satellites

Correct Answer: D

Explanation: The GPS satellite constellation is nominally designed with 24 satellites (21 active + 3 spares in the original design), orbiting the earth to provide global coverage.

Q78. Vehicle used to carry the sensor

Correct Answer: D

Explanation: In remote sensing/positioning terminology, the vehicle (satellite, aircraft, balloon, etc.) used to carry a sensor is called the platform.

Q79. Most commonly used planimeter

Correct Answer: B

Explanation: The Amsler polar planimeter is the most commonly used type of planimeter for measuring plane areas from a map or drawing.

Q80. Tangent clinometer also known as

Correct Answer: D

Explanation: A tangent clinometer, used for measuring vertical angles/slopes, is also known as an Abney level.

Q81. V shaped gullies formed where subsoil is

Correct Answer: B

Explanation: V-shaped gullies typically form when the subsoil is more resistant to erosion than the topsoil, restricting lateral widening and forcing the gully to cut narrow and deep.

Q82. Bench terraces – medium rainfall, permeable deep soil

Correct Answer: B

Explanation: Outward sloping bench terraces are suitable for regions with medium rainfall and highly permeable, deep soils, as they allow safe disposal of excess runoff without excessive water retention.

Q83. Permissible flow velocity in grassed waterways

Correct Answer: D

Explanation: Once a good, dense stand of grass cover is established in a grassed waterway, permissible flow velocities of about 2 to 2.5 m/s can be allowed without causing erosion.

Q84. Surface slope increased 4x – runoff velocity effect

Correct Answer: A

Explanation: By Manning's/Chezy's relations, velocity of flow is proportional to the square root of the slope ($V \propto \sqrt{S}$). If slope increases four times, velocity increases by $\sqrt{4} = 2$ times.

Q85. Spur at right angles to flow on either side of stream

Correct Answer: B

Explanation: A spur built at right angles to the flow, projecting from the bank, deflects the current away from the bank and is known as a deflection (repelling) spur.

Q86. Incorrect statement(s) about a PTO

Correct Answer: C

Explanation: Statement (i) is correct – PTO speed is governed by engine speed. Statement (iii) is correct – the standard 6-spline PTO shaft runs at 540 ± 10 rpm. Statements (ii) and (iv) are incorrect: PTO speed does not depend on the tractor's travel/ground speed (it runs off engine speed through a separate PTO clutch), and power loss through the PTO drive is actually lower than through the drawbar, not higher.

Q87. Difference in distance – front wheel centre lines

Correct Answer: B

Explanation: Toe-in is the difference in distance between the centre lines of the front and back edges of the front wheels, used to check front-wheel alignment of the tractor.

Q88. Mechanical manipulation of soil in standing water

Correct Answer: C

Explanation: Puddling is the mechanical working (churning) of soil in standing water to break down soil aggregates and form a compact, least-pervious layer, commonly practiced in paddy fields to reduce percolation losses.

Q89. Angle of cutting edge of disc to direction of travel

Correct Answer: B

Explanation: The disc angle is the angle between the plane of the cutting edge of a disc (e.g., of a disc plough/harrow) and the direction of travel.

Q90. % unthreshed grains from all outlets (thresher)

Correct Answer: D

Explanation: Cylinder loss refers to the percentage (by weight) of grains that remain unthreshed and pass out with the straw/material from all outlets, expressed relative to the total grain input to the thresher.

Q91. Cutter bar outer end ahead of inner end (mower)

Correct Answer: D

Explanation: Keeping the outer end of the cutter bar slightly ahead of the inner end (to compensate for backward deflection during cutting) is known as providing 'lead' to the cutter bar.

Q92. Mouldboard bottom for sticky/poorly scouring soils

Correct Answer: C

Explanation: Slotted or slat-type mouldboard bottoms are specially designed to reduce soil adhesion and are used for ploughing in sticky or poorly scouring soils.

Q93. Blade commonly used in rotary tiller (general soil)

Correct Answer: B

Explanation: L-type blades are the most commonly used blades in rotary tillers (rotavators) for general soil-working conditions, offering good soil pulverization with moderate power requirement.

Q94. Correct statement(s) – flood jet nozzle

Correct Answer: C

Explanation: A flood-jet nozzle produces a wide, flat fan spray of relatively coarse droplets, which helps reduce chemical (spray) drift, and is also known as a deflector nozzle. Its spray angle is typically much wider than $30-60^\circ$, and it operates at relatively low pressures rather than 40–100 psi, so statements (ii) and (iv) are not correct.

Q95. Seed rate adjustment – fluted roller metering unit

Correct Answer: A

Explanation: In a fluted-roller seed metering unit, the seed rate is primarily adjusted by varying the exposed (effective) length of the fluted roller, and by effectively varying the number of flutes engaged, which together regulate the volume of seed metered per rotation.

Q96. Unit operation improving keeping quality of milk

Correct Answer: C

Explanation: Pasteurisation (controlled heat treatment) primarily improves the keeping quality/shelf life of milk by destroying pathogenic and spoilage micro-organisms before distribution.

Q97. Hot-air drying 30–50°C – property that decreases

Correct Answer: B

Explanation: When air is heated without adding moisture, its absolute moisture content (humidity ratio) stays constant, but since warmer air can hold more moisture at saturation, its relative humidity decreases.

Q98. Improved head rice recovery after parboiling – reason

Correct Answer: D

Explanation: During parboiling, starch inside the grain gelatinizes and, on drying, sets into a stronger, more compact kernel structure, which resists breakage during milling and thereby improves head rice recovery.

Q99. Greatest influence on EMC of food grains

Correct Answer: C

Explanation: The equilibrium moisture content (EMC) of food grains is influenced mainly by the relative humidity of the surrounding air (along with temperature), since grains absorb or release moisture until equilibrium is reached with the ambient air's vapour pressure.

Q100. Increasing moisture beyond optimum – screw press effect

Correct Answer: B

Explanation: Excess moisture in oilseeds during screw-press extraction interferes with proper pressing and oil separation, generally reducing extraction efficiency and oil yield.

