ZONE TECH

समीक्षा

RSSB JE 2026

HYBRID TEST SERIES

SOLUTION

Paper ID

505

Stream

Civil Engineering (B.Tech)

ACCURATE ANSWERS
Every answer is precise & reliable

DETAILED EXPLANATIONS
Concept clarity with step-by-step solutions

BETTER PREPARATION
Improve performance & achieve success

Exam Date
23 AUG 2026

Subject
SURVEYING & HIGHWAY & BRIDGE ENGINEERING

Click to Enroll zonetech.in/rssb-je-test-series

|| आपकी सफलता, हमारी प्रतिबद्धता ||

1. Answer C

Solution

Order of engineering survey for highway alignment-

Map study-Gives a rough guidance of the routes to be further study in the field.

Reconnaissance- To examine general characteristics of the area with a view to select possible alternate alignments.

Preliminary survey- Air is to finalize the most suitable alignment out of various alternative.

Final location and detailed surveys-Alignment finalized in the design office during primary survey is to be first located on the field.

2. Answer C

Solution

1 m = 3.2808 ft

1 m × 1 m = 3.2808 ft × 3.2808 ft

1 m^2 =10.7636 ft^2

$$1\text{sq.ft.} = \frac{1\text{m}^2}{10.7636} = 0.092905\text{m}^2$$

3. Answer C

Solution

Macadam construction-

The most important modification made in macadam's method with respect to the older methods are-

(i) The importance of subgrade drainage and compaction were recognized and so the subgrade was compacted and was prepared with a cross slope of 1 in 36.

(ii) Macadam was the first person to suggest that heavy foundation stones are not at all necessary to be placed at the bottom laver of construction.

4. Answer A

Solution

The shape of the triangle in which any error in angular measurements has a minimum effect upto the lengths of the computed sides is know of well conditioned triangle. Hence the best shape of a triangle is an isosceles triangle whose base angles are 56° 14′

5. Answer D

Solution

Lucknow road plan-

The third-twenty year plan (1981-2001)

Target 82 km/100 sq. km.

Expressways of total length 2000 km should be developed for fast travel.

Total length of national highways in the country should be 66000 km or $\frac{\text{area of km}^2}{50}$

Total length of state highway in the country should be 145000 km.

Length of state highway = $\frac{\text{area of km}^2}{25}$ or 62.5 × number of towns.

6. Answer A

Solution

The main idea of working from whole to part is to localize the error and prevent their accumulation, the error accumulate and expend to a greater magnitude in the process of expansion of survey.

7. Answer B

Solution

The **penetration test** determines the hardness or softness of bitumen by measuring the depths in tenths of a millimetre to which a standard loaded needle will penetrate vertically in five seconds. The sample is maintained at a temperature of 25°C.

8. Answer D

Solution

Formation width-

Width of formation or roadway is the sum of widths of pavement or carriageway including separates if any, and the shoulders.

Formation or roadway width is the top width of the highway embankment or the bottom width of highway cutting excluding the side drains.

9. Answer D

Solution

$SSD = SDD_1 + SSD_2$

$SSD_1 = vt + \frac{v^2}{2gf\eta}$

$= 25 \times 2.5 + \frac{25^2}{2 \times 10 \times (0.7 \times 0.5)} \left[\text{Taken } g = 10 \frac{m}{sec^2} \right]$

= 151.78 m

Similarly

$SSD_2 = 16.67 \times 2.5 + \frac{16.67^2}{2 \times 10 \times (0.7 \times 0.5)}$

= 81.36 m

$SSD = SSD_1 + SSD_2 = 233.14 \text{ m} \simeq 236 \text{ m}$

10. Answer D

Solution

Curtain wall (or apron) is an underground protective wall built beneath the river bed between masonry structures. Its primary purpose is to act as a barrier to prevent water from scouring and undermining the main foundation of the bridge

11. Answer C

Solution

Metric chain - Metric chain are made in length 20 m and 30 m.

A 20 m chain has 100 links each of 20 cm and 30 m chain has 150 links.

Tolerance in chain -

For 5 m chain = ±3 mm

For 20 m chain = ±5 mm

For 30 m chain = ±8 mm

12. Answer C

Solution

Bridge Bearing Span Classification

- **Shallow / Fixed plate bearings:** Up to 12 m
- **Deep cast base / Sliding plate bearings:** 12 m to 20 m
- **Rocker bearings: more than 20 m**

13. Answer C

Solution

N = 6%, R= 68m

Grade compensation = $\frac{30 + R}{R} = \frac{30 + 68}{68} = 1.44$

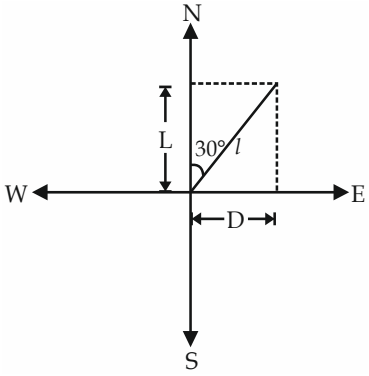
Or $\frac{75}{R} = \frac{75}{68} = 1.10$

Use minimum i.e., 1.10%

Compensated gradient = 6 – 1.10 = 4.9%

14. Answer D

Solution



The departure of the line,

$D = l \sin\theta$

$D = 10 \sin 30°$

$D = \frac{10}{2} = 5 \text{ m}$

15. Answer D

Solution

Least count of vernier scale is the difference between one main scale division and vernier scale division.

L.C. = 1 M.S.D. - 1 V.S.D.

$L.C. = 1 M.S.D. - \frac{16}{20} M.S.D.$

$L.C. = \frac{(20 - 16)}{20} M.S.D.$

$L.C. = \frac{4}{20} \times 1mm(given) = 0.2mm$

16. Answer D

Solution

Line ranger- It is an optical instrument used in surveying for ranging. It is used in the process of locating an intermediate point in a straight line between two end points of the survey line.

Sprit level- A sprit level is an instrument designed to indicate whether a surface is horizontal.

Compass- It is a device that shows the cardinal directions use for navigation and geographic orientation.

17. Answer A

Solution

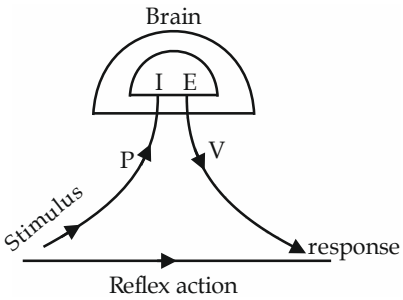
PIEV Theory – Total reaction time of drives is split into four parts.

(i) Perception

(ii) Intellection

(iii) Emotion

(iv) Volition



P = Perception

I = Intellection

E = Emotion

V = Volition

18. Answer B

Solution

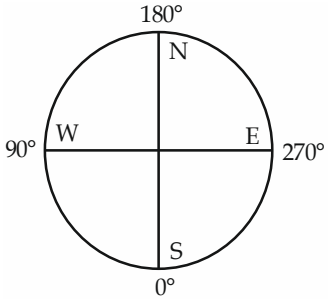
IRC Bridge Classifications

- **Culvert**: Total length up to 6 meters.
- **Minor Bridge**: Total length between 6 meters and 30 meters.
- **Major Bridge**: Total length between 30 meters and 120 meters.
- **Long Span Bridge**: Total length exceeding 120 meters.

19. Answer B

Solution:

The zero graduation in a prismatic compass is marked in the south end of the circle.



20. Answer D

Solution

Average length of chain =

Area of plan = 32.50 sq.m.

Area of ground = $32.56\ (8)^2$

A' = 2083.34 sq.m.

$$\text{True area} = A = \left(\frac{L_1}{L}\right)^2 \times A'$$

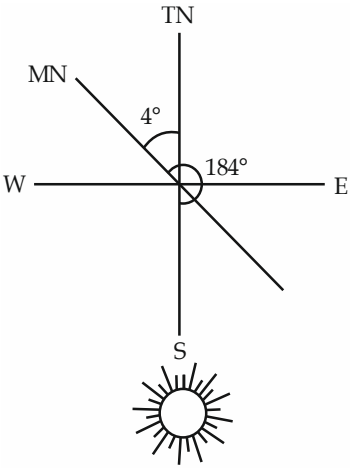
$$= \left(\frac{20.2}{20}\right)^2 \times 2083.84$$

$2125.72 m^2$

$2126 m^2$

21. Answer A

Solution



TB = MB ± declination

180 = 184 ± declination

Declination = -4

Hence declination 4 w

22. Answer A

Solution

Third-Order or Tertiary Triangulation:

The third-order triangle consists of a number of points that are fixed within the framework of the second triangle and form the instant control for detailed engineering and other survey's.

The sizes of triangles are small and can be used with devices with medium accuracy.

The specifications for a third-order triangulation are as follows :

Average triangle closure : 6 sec

Maximum triangle closure : 12 sec

Length of baseline : 0.5 to 3 km

Length of sides of triangles : 1.5 to 10 km

Actual error of base : 1 in 75,000

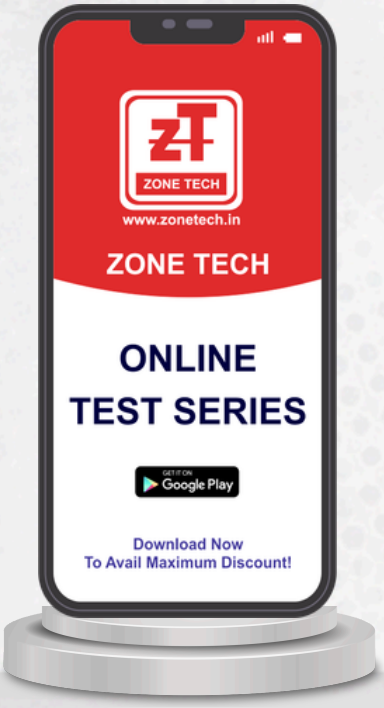
Probable error of base : 1 in 250,000

Probable error of computed distance : 1 in 5,000 to 1 in 20,000

Probable error in astronomic azimuth : 5 sec

ZONE TECH

Best Institute For Assistant & Junior Engineer



अब करिये AEn & JEn Exam की तैयारी...!!

सबसे ज्यादा Toppers और Selections देने वाले संस्थान के साथ

संकल्प Batch RSSB-JE

CIVIL ENGG. B.Tech

- Complete Syllabus Coverage
- Topic-Wise DPP & Workbook Practice
- Regular Test Series
- PDF Notes & Study Material
- Dedicated Doubt Support

तेजस Practice Batch

CIVIL ENGG. B.Tech

- Total 4500+ Questions
- 3000+ Tech Question
- 1500+ Non Tech Question
- Get Question & Solution Pdf
- Dedicated Doubt Support

ZONE TECH OFFCIAL

ZONE TECH OFFCIAL

JOIN NOW

www.zonetech.in

98287-47676, 94624-47676

23. Answer D

Solution

Given,

V = 110 kmph

E = 8% = 0.08

F = 0.10

$$e+f=\frac{V^2}{127R}\Rightarrow 0.08+0.10=\frac{(110)^2}{127R}$$

$$R=\frac{110^2}{127(0.08+1.10)}$$

R = 529.30m

24. Answer D

Solution

Main parts of a compass-

- Magnetic needle
- Pivot
- Graduated ring
- Eye vane
- Object vane
- Prism
- Lifting pin and lever
- Compass box
- Mirror
- Sunglass
- Agate cap

25. Answer B

Solution

$$T_S=(R+S)\tan\frac{\Delta}{2}+\frac{L}{2}$$

Where,

T_S = Total tangent length of the curve

R = Radius of the curvature

Δ = Deflection angle

L = Length of the transition curve

$$S = \text{Shift} = \frac{L^2}{24R}$$

26. Answer A

Solution

The sensitivity of a bubble tube is with the rise in temperature, sensitivity of a bubble tube decrease.

27. Answer B

Solution

Given,

g_1 = +1.2%

g_2 = -0.8%

Rate of change of grade = 0.1% per 20m chain

$$\text{Length of vertical curve} = \left(\frac{g_1-g_2}{r}\right)$$

$$\left(\frac{1.2-(-0.8)}{0.1}\right)=20 \text{ chain}$$

28. Answer A

Solution

"Check levelling"

Check levelling can be conducted regarding the activities of the running levels to check the lists of levels and these levels or series have been previously determined. After the work of every day in agriculture, the level line has been kept and the individual returns to the beginning part and detect the work process regarding this type of levelling.

"Reciprocal levelling"

"Reciprocal levelling" helps an individual to make differentiation among the elevation of the two points. It can be said that through this levelling the two types of observation can be differentiated minutely and accurately. This process is only applicable when there is no possibility to fix the level among the two points in the midway.

"Barometric levelling"

Through "Barometric levelling", the altitudes of the various points agave been detected. This detection can be conducted through the use of a barometer. Through this levelling, the pressure of the atmosphere can be measured.

"Hypsometry"

Hypsometry levelling is another process of levelling in that the heights of hills or the mountains can be measured through the detection of the temperature and most importantly, this temperature has been taken to the level at which the water boils.

29. Answer B

Solution

Afflux is the rise in the water level on the upstream side of a bridge caused by the obstruction of the piers.

30. Answer B

Solution

Given,

Distance (d) = 1.29km

Combined correction (C) = $0.06728d^2$

$= 0.06728 \times (1.29)^2$

$= 0.1119$m or 0.112 m

31. Answer B

Solution

Deviation angle, $n_1 = 3\%$, $n_2 = 5\%$

$N = n_1 - (-n_2) = n_1 + n_2$

$N = 3\% + 5\% = 8\%$

L > SSD, S = 125 m.

Length of summit curve $L = \frac{NS^2}{4.4} = \frac{8}{100} \times \frac{(128)^2}{4.4}$

L = 298 m.

32. Answer B

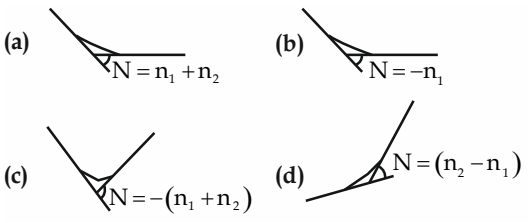
Solution

Gale's traverse table calculations- The correct sequence of these steps in Gale's traverse table calculation is-

1. Calculation of interior angles
2. Calculation of bearing
3. Calculation of ΣL and ΣD
4. Correction of latitude and departures
5. Calculation of independent angles

33. Answer A

Solution



Design of valley curves :

Cubic parabola is generally preferred is valley curve as per IRC.

Criteria:

(1) Vehicle head light distance

(2) Motorists comfort (Rate of change of centrifugal acceleration)

(3) Cross drainage control at lowest point of velley.

(4) General aesthetic considerations.

The valley curve is usually made fully transitively by providing two similar transition curve of a equal length (without a circular curve in between)

34. Answer A

Solution

Permissible closing error i.e E is

$E = C\sqrt{K}$

Where,

K = Distance in kilometer

C = 4 → For precise levelling

= 12 → Accurate levelling

= 24 → Ordinary levelling

= 100 → Rough levelling

35. Answer C

Solution

(i) Adjustment of surveying instruments means that various of the instruments are brought into proper relation with each other.

(ii) Bowditch's rule is used to adjust the traverse by distributing closing error to latitudes and departures.

(iii) In triangular length of one line i.e., base line is measured very precisely and all the angles art measured, whereas in trilateration length of all the sides are measured and no angular measurement is done.

(iv) Three point problem in plane table surveying can be solved by --

(a) Trial and error method

(b) Bessel's method/graphical method

(c) Mechanical method

36. Answer A

Solution

According to Indian Roads Congress (IRC) standards for highway design:

- **Intermediate Sight Distance (ISD)** is provided when Overtaking Sight Distance (OSD) cannot be practical.
- It gives drivers limited opportunities to overtake safely.
- It is mathematically defined as twice the **Stopping Sight Distance (SSD).**

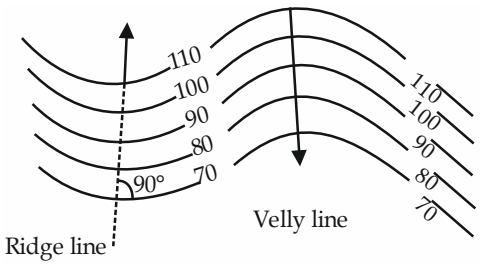
ISD = 2 × SSD

37. Answer A

Solution

Contour lines cross a valley line at right angle 90° They form sharp curves of V-shape across it with convex side of the curve towards the higher ground.

Contour lines cross a watershed or ridge line at right angles 90°. They form curves of U-shape round it with the concave side of the curve towards the higher ground.



38. Answer A

Solution

Given,

Wheel base (l) = 7.5 m

Radius (R) = 40 m

$$\text{Off tracking} = \frac{\ell^2}{2R}$$

$$= \frac{(7.5)^2}{2\times 40} = 0.703\text{m}$$

39. Answer A

Solution

If the lower clamp screw is tightened and the upper clamp screw is losened. Then lower plate does not move whereas upper plate moves. Thus the vernier moves and hence the reading recorded using vernier changes.

40. Answer A

Solution

As compared to chaining on flat grounds the accuracy of tacheometric distance are low, but on steep grounds the accuracy is more.

The primary objective of a tacheometric survey is the preparation of a contoured plan. It is particularly suitable for filling in details on topographic maps preliminary location survey and surveying steeps grounds, broken bound aries and water stretches etc.

41. Answer A

Solution

Speed limit signs are circular in shape and have white background and red border respectively.

As per IRC: 67-2001, a traffic sign indicating the speed limit on a road should be of circular shape with White Background and Red Border.

42. Answer A

Solution

Zenith (Z) - Point on celestial sphere vertically above observer position on earth called zenith point.

Nadir (N) - Point vertically below the observer positions on earth clestial sphere known as nadir point.

Note - Line passing through zenith & Nadir called Z-N line.

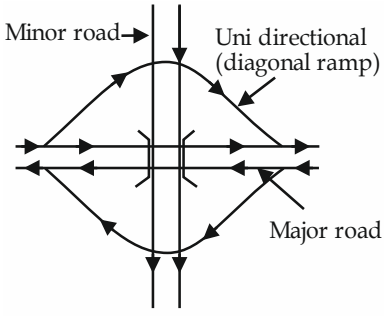
43. Answer A

Solution

Diamond inter change-

Diamond interchange is not a road junction of same elevation, it is the simplest of 4-leg interchange design.

The ramps which provide for one way movement are usually elongated along the major highway and may be curved parallel to the major highway.



Diamond interchange

44. Answer C

Solution

Balancing in is a method of establishing intermediate point on a line when the. end points are not intervisible, but they are visible from some intermediate point. Balancing in is also called wiggling in

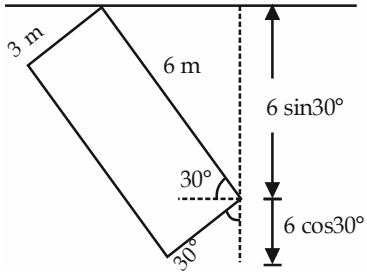
45. Answer A

Solution

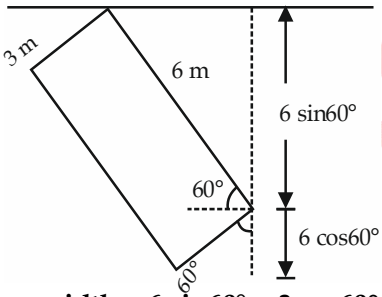
Leica Geosystem has introduced smart station the world's first high performance total station with integrated GPS and GPS Spider NET, the world's first network RTK software supporting the RTCM standard V3.0 based on the Master Auxiliary concept.

46. Answer A

Solution



30° parking width = 6 sin30° +3 cos30°



60° parking width = 6 sin60° + 3 cos60°

$$\text{ratio} = \frac{6\times\frac{1}{2}+3\frac{\sqrt{3}}{2}}{6\times\frac{\sqrt{3}}{2}+3\times\frac{1}{2}}$$

$$= \frac{5.598}{6.696} = 0.83$$

47. Answer A

Solution

- Slope correction = $\frac{-h^2}{2L}$
- Temperature correction = $\pm\alpha(T_m - T_0)L$
- Mean sea level correction = $-\frac{Lh}{R}$
- Pull correction = $\frac{\pm(P_m - P_0)L}{AE}$

48. Answer B

Solution

Missing length of line, SP = L

WCB of line, SP = θ

In a closed traverse, sun of latitudes i.e.

$\Sigma L\cos\theta = 0$

200 cos0° + 1000 cos 45° + 907 cos 180° + L cosθ=0

L cosθ = - 0.107 ...(1)

Sum of departure i.e.,

$\Sigma L\sin\theta = 0$

200 sin0° + 100 sin 45° + 907 sin 180° + L sinθ = 0

L sinθ = - 707.107 ...(2)

Dividing equation (2) by equation (1)

tanθ = 6608.476

θ = 89.99°

≈ 90°

Both L cosθ and L sinθ have negative value hence third quadrant.

S_0 θ=90° + 180° = 270°

and $L = \frac{-707.107}{\sin 270°} = 707.1\,m$

49. Answer C

Solution

(A) Spot speed - By doppler radar

(B) Traffic volume - By pneumatic tube

(C) O-D survey - By road side interview

(D) Parking survey - By video tape

50. Answer C

- Errors in reading the tape – Mistake
- Errors due to temperatue - Cumulation + or –
- Incorrect counting of tape lengths – Blunder
- Bad ranging - Cumulative +
- Variation in pull - Compensating

51. Answer A

Solution

U_{max} = 100 km/h, spacing = 10 m

Jam density = $\frac{1000}{10} = 100\,\text{Vehicle/km}$

Flow capacity per lane = $\frac{U_{max}}{2}\times\left(\frac{K_{max}}{2}\right)$

$= \left(\frac{100}{2}\right)\times\left(\frac{100}{2}\right)$

= 50 × 50

= 2500 vehicle/hr

52. Answer B

Solution

Lost time per cycle = 16 sec

Normal flows, q_1 = 500 Vph

q_2 = 300 Vph

Saturation flows S = 1600 Vph

$$y = y_1 + y_2 = \frac{q_1}{S} + \frac{q_2}{S}$$

$$= \frac{500}{1600} + \frac{300}{1600} = \frac{800}{1600} = 0.5$$

As per webster, cycle time

$$C_0 = \frac{1.5L + 5}{1 - y} = \frac{1.5(16) + 5}{1 - 0.5}$$

C_0 = 58 sec

53. Answer C

- Crab and Drift - Aerial photogrammetric
- Stadia intercept – Tachometric
- Culmination and elongation - Astronomical
- Baseline measurement - Triangulation

54. Answer B

Solution

Type of binder		Uses
(A)	80/100 penetration grade bitumen	Bituminous roads
(B)	85/25 Blown bitumen	Mastio- asphalt
(C)	MC- 70 cutback	Prime- coat
(D)	RT-5 Road tar	Grouting works

55. Answer A

- **Statement A is CORRECT:** Contour maps are widely used to calculate reservoir capacity and earthwork volume. The **trapezoidal formula** and **prismoidal formula** are the two standard mathematical methods used for these computations.
- **Statement B is CORRECT:** The prismoidal formula treats the ground volume as a series of prisms or pyramids. It yields much more accurate results (performing better) when there is a **higher number of contour data points with minimum gaps** or closely spaced intervals.

56. Answer C

Solution

As per IRC: 37-2012, clause No: 6.2.2

$$N_f = 2.21 \times 10^{-4} \left(\frac{1}{\varepsilon_t}\right)^{3.89} \times \left(\frac{1}{M_R}\right)^{0.854}$$

Where

N_f = Fatigue life in terms of standard axles

ε_t = Tensile strain at the bottom of bituminous layer

M_R = Resilient modulus of bituminous layer

From the options given in the question

Flexible pavement consisting of granular base and sub base depends on

1. Resilient Modulus (MR)
2. Horizontal tensile strain at the bottom of bituminous layer.

Statements 1 and 2 are correct

Statement -4 is wrong. The design is independent of vertical sub-grade strain. Infact it depends on horizontal sub-grade strain.

The appropriate answer is (c)

57. Answer D

Solution

(i) Bitumen 80/100- The characteristics of this grade confirmed to that of S 90 grade as per IS 73-1992.

(ii) Bitumen 60/70- This is harder grade than 80/100 and confirmed to S 65 grade of IS 73-1992.

(iii) Bitumen 30/40- This is the hardest of all grades and confirmed to S 35 grade of IS 73-1992

58. Answer C

Solution

The ductility of binder is an indication of its elasticity and ability to deform under load and return to original condition.

Comparison between Tar and Bitumen

Properties	Bitumen	Tar
1. Colour	Black to dark brown	Colour same as bitumen
2. Temperature susceptibility	Less temperature susceptible	more temperature susceptible resulting in greater variation in viscosity with temperature
3. Ductility	Less ductile	More ductile

59. Answer D

Solution

Given

Loss in weight of sample = 25 g

So, Coefficient of hardness

$$= 20 - \frac{\text{Loss in weight of sample}}{3}$$

$$= 20 - \frac{25}{3}$$

$$= \frac{60-25}{3} = 11.66$$

60. Answer A

- Statement A is CORRECT: Reading both verniers (usually opposite verniers A and B) and taking their average eliminates errors due to the eccentricity of the centers and verniers.
- Statement B is CORRECT: By measuring the angle multiple times at different parts of the graduated circle, errors due to imperfect graduations on the scale are averaged out and eliminated.

61. Answer C

- **Movable hair method:** In this system (also known as the subtense method), the distance between the targets on the leveling staff is kept constant. To take readings at different distances, the surveyor turns a micrometer screw to change the distance between the stadia hairs until they bisect the targets. Therefore, the **staff intercept is constant** and the **stadia hair interval is variable.**
- **Fixed hair method:** This is the most common form of tacheometry. The distance between the upper and lower stadia hairs on the telescope's diaphragm is strictly fixed. Because of this, when you view a staff from varying distances, the portion of the staff caught between those hairs changes. This means the **staff intercept is variable** and the **stadia hair interval is fixed**.
- **Tangential method:** This method is specifically utilized when the instrument telescope does not contain stadia hairs. Instead, horizontal distances and elevations are computed by taking two separate vertical angle readings against a single, central horizontal crosshair targeting two vanes on the staff. Thus, **stadia hairs are not used**.

62. Answer A

Solution

Air void%

$$V_{av} = \left(\frac{G_t - G_m}{G_t}\right) \times 100$$

G_m = bulk specific gravity

G_t = Theoretical specific gravity

$$= \left(1 - \frac{G_m}{G_t}\right) \times 100$$

$$= \left(1 - \frac{2.373}{2.478}\right) \times 100 = 4.23\%$$

63. Answer D

Solution

In compass surveying, the theoretical difference between the Fore Bearing (FB) and Back Bearing (BB) of a line must be exactly 180° (|FB-BB| = 180°). If this difference is not equal to 180°, it indicates that an error has occurred due to one or more of the following reasons:

1. Observational Errors:

- An error made while reading or recording the measurements.
- Statements I and II only list an error in either the fore bearing or the back bearing individually. However, a discrepancy can happen if errors are present in both measurements (Statement III).

2. Local Attraction:

- Magnetic interference affecting the compass needle.
- This can occur at either one or both of the surveying stations (Statement IV).
- Therefore, statements III and IV are valid reasons for the discrepancy.

64. Answer C

Solution

$d_1 = 30$ cm, $k_2 = ?$

$k_1 = 20$ kg/cm^3, $d_2 = 75$ cm

$k_1d_1 = k_2d_2$

$$k_2 = \frac{k_1d_1}{d_2} = \frac{30 \times 20}{75}$$

$$K_2 = 8 kg/cm^2$$

65. Answer D

Solution

The thin layer of bitumen coating between an existing bituminous layer and a new bituminous layer is tack coat.

Prime coat-The interface treatment provided to plug in the voids of porous surface and to bond loose particles in bituminous pavement is called prime coat.

Seal coat-Seal coating consists of application of liquid asphalt material to the roadway followed immediately by the application of the aggregate.

66. Answer D

Solution

- The horizontal axis (also known as the trunnion axis) must be perpendicular (at a right angle) to the vertical axis, not parallel. This alignment ensures that when the telescope is rotated vertically, it sweeps out a truly vertical plane.
- The axis of the plate level must be perpendicular to the vertical axis. This setup guarantees that when the bubble is centered, the vertical axis becomes perfectly vertical.
- The line of collimation (line of sight) must be perpendicular to the horizontal axis so that horizontal angles are measured accurately.
- The axis of the telescope level (altitude bubble tube) must be parallel to the line of collimation to ensure accurate vertical angle measurements.

67. Answer C

Solution

- **Statement (i) is correct:** Dowel bars are short, smooth steel bars placed across **transverse joints** (contraction or expansion joints) in concrete pavements.
- **Statement (ii) is correct:** They permit horizontal movement while transferring heavy wheel loads between adjacent slabs, thereby maintaining the slab edges at the same level and preventing faulting.
- **Statement (iii) is correct:** Tie bars are deformed steel bars placed across **longitudinal joints** to prevent the two adjacent concrete lanes from separating or drifting apart.

68. Answer B

Solution

- **Statement 1 is CORRECT:** According to the Indian Roads Congress (IRC:38 / IRC:73), the maximum superelevation (e_{max}) for plain and rolling terrain is 7% (0.07).
- **Statement 2 is CORRECT:** The 98th percentile speed is designated as the design speed for checking and designing geometric elements of a highway to ensure safety for almost all fast-moving vehicles.
- **Statement 3 is INCORRECT:** According to IRC, the width of a two-lane carriageway without a raised kerb is 7.0 meters (3.5 m per lane). It is 7.5 meters only when raised kerbs are present.

69. Answer C

Solution

For 20 m chord degree of curve

$$D = \frac{1145.9}{R}$$

70. Answer C

Solution

- **Statement I is correct:** In the **Quadrantal Bearing (QB)** system (also called the Reduced Bearing system), the bearing of a line is measured clockwise or counterclockwise (eastward or westward) from either the North or South pole, depending on whichever is closer to the line. The value always ranges between 0° and 90°.
- **Statement II is correct:** The Quadrantal Bearing system is also widely known as the **Reduced Bearing (RB)** system.

71. Answer D

Solution

- If the CBR value at 5.0 mm penetration happens to exceed the value at 2.5 mm, the test must be repeated to rule out any experimental errors.
- According to standard pavement design guidelines, if the repeat test yields identical results (meaning the 5.0 mm value is still higher), then the **CBR value corresponding to the 5.0 mm penetration** should be chosen for the design, not the 2.5 mm value.

72. Answer D

Solution

- Closed contours increases in elevation from inside to outside in case of a depression where the controus increases in elevation from outside to inside in case of hill.
- Contour lines cross a valley line at right angles forming V shaped curves with their convex side towards the higher elevations.

73. Answer A

Solution

- **Warping stresses** happen when there is a daily temperature difference between the top and bottom of a concrete slab.
- During the day, the sun heats the top surface while the bottom stays cooler.
- During the night, the top cools down while the bottom stays warmer.
- This difference in temperature forces the concrete to bend or warp, creating stress.
- **Frictional stresses** happen due to long-term or seasonal changes in temperature.
- When the overall temperature rises uniformly, the entire concrete slab tries to expand.
- When the temperature drops uniformly, the entire slab tries to contract (shrink).
- As the slab tries to move, the soil layer beneath it resists this movement, creating friction along the bottom layer of the pavement.

74. Answer A

Solution:

- Accurate centering in plane table surveying is required for large scale maps, where as accurate orientation is more important than accurate centering for small scale maps.
- For plotting of in accessible points, method of intersection is employed.
- Plane table is useful in open area having good intervisibility between various points.

75. Answer B

Solution

- Aggregate hardness - Los Angeles apparatus
- Bitumen adhesion - Dynamic immersion
- Consistency of bitumen - Float test
- Flash point of bitumen - Pensky- Martens test

76. Answer C

Solution

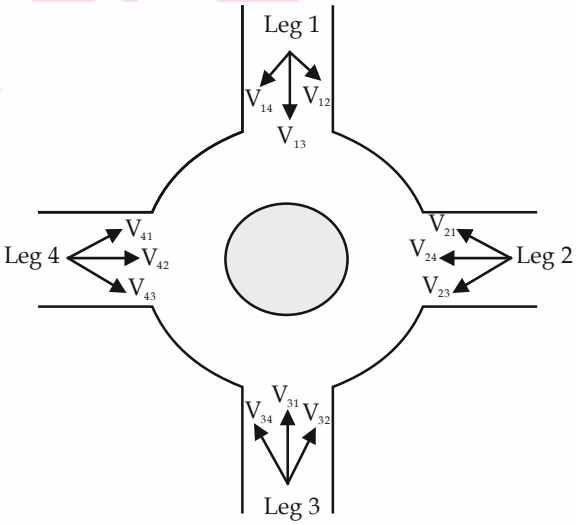
- The difference b/w mean and apparant solar time comes out to be very close to zero which is called as equation of time

77. Answer A

Solution

We know that

$$\text{Weaving ratio(p)} = \frac{\text{sum of crossing streams}}{\text{Total traffic on weaving section}}$$



$$P_{2\text{-}3} = \frac{\text{Weaving traffic between legs 2 and 3}}{\text{Total traffic between legs 2 amd 3}}$$

$$P_{2\text{-}3} = \frac{V_{13} + V_{43} + V_{21} + V_{24}}{V_{13} + V_{43} + V_{21} + V_{24} + V_{23} + V_{14}}$$

$$P_{2-3} = \frac{450 + 600 + 310 + 1090}{450 + 600 + 310 + 1090 + 200 + 412} = \frac{2450}{3062} = 0.80$$

78. Answer A

Solution

When declination of star (δ) is less than the altitude (θ) then upper culmination occur at south of the zenith, then zenith distance

$= \theta - \delta$

$= 43° 30' - 21° 15'$

$= 22° 15'$

79. Answer C

Solution

A transition curve introduced between the tangent and the circular curve should fulfill the following condition

(i) It should be tangential to the straight

(ii) It should meet the circular curve tangentially

(iii) Its curvature should be zero at the origin on straight

(iv) Its curvature at the junction with the circular curve should be the same as that of circular curve

(v) The rate of increase of curvature along the transition should be the same as that of increase of cant or super elevation

(vi) Its length should be such that full cant or superelevation is attained at the junction with circular curve

80. Answer D

Solution

$D = kS + C$

$k \simeq 100$

$C \simeq 0$

$D = 100 \times 0.75$

$D = 75\,m$