CLASS TEST

S.No.: 03DLSKCE_IJKLM_090826

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SURVEYING ENGINEERING

CIVIL ENGINEERING

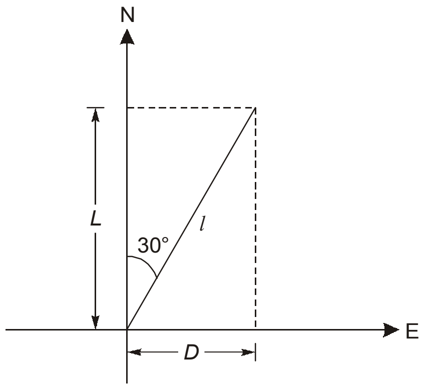
Date of Test : 09/08/2026

ANSWER KEY

1.	(c)	7.	(d)	13.	(c)	19.	(c)	25.	(a)
2.	(d)	8.	(d)	14.	(c)	20.	(d)	26.	(c)
3.	(a)	9.	(c)	15.	(b)	21.	(b)	27.	(b)
4.	(c)	10.	(c)	16.	(d)	22.	(c)	28.	(c)
5.	(d)	11.	(d)	17.	(b)	23.	(a)	29.	(d)
6.	(a)	12.	(a)	18.	(a)	24.	(c)	30.	(b)

DETAILED EXPLANATIONS

3. (a)



The departure of the line is,

$$D = l \sin 30° = 20 \sin 30° = 10 \text{ m}$$

4. (c)

Let the length of line measured on plan be L.

Actual area, $A = (4000\,L)^2$

Measured area, $A_m = (5000\,L)^2$

$$\text{Percentage error in area} = \frac{(5000\,L)^2 - (4000\,L)^2}{(4000\,L)^2} \times 100 = 56.25\%$$

5. (d)

Multiplying constant = k

Additive constant = 0, for anallactic lens

$\therefore$ $D = ks$

$\Rightarrow$ $D \,\alpha\, s$

6. (a)

$$\text{Hypotenusal allowance} = l(\sec\theta - 1)$$

$\Rightarrow$ $0.1 = 30(\sec\theta - 1)$

$\sec\theta = 1.0033$

$\therefore$ $\tan\theta = \sqrt{\sec^2\theta - 1}$

$\Rightarrow$ $\tan\theta = 0.0813 = \dfrac{1}{12.3}$

7. (d)

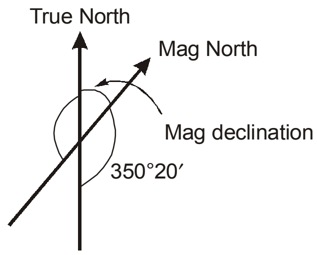
$$\text{Measured length} = 468 \text{ m}$$

$$\text{R.F. of wrong scale used} = \frac{1}{20 \times 100} = \frac{1}{2000}$$

$$\text{R.F. of correct scale} = \frac{1}{40 \times 100} = \frac{1}{4000}$$

$$\therefore \quad \text{Correct length} = \frac{(1/2000)}{(1/4000)} \times 468 = 936 \text{ m}$$

8. (d)



Since the magnetic bearing of the Sun is 350° 20′, it is at the North of the place and hence the true bearing of the Sun, which is on the meridian, will be 360°.

Now, True bearing = Magnetic bearing + Declination

$$360° = 350°\,20' + \text{Declination}$$

or $$\text{Declination} = 360° - 350°\,20'$$

$$= 9°\,40' \text{ E}$$

9. (c)

If l is the length of the offset, the linear error is $\frac{l}{r}$. Displacement due to angular error = $l\sin\alpha$. These two errors are to be equated.

$$\therefore \quad l\sin\alpha = \frac{l}{r}$$

$$\Rightarrow \quad r = \text{cosec}\,\alpha = \text{cosec } 4° = 14.34 \approx 14$$

The accuracy in linear measurement required is 1 in 14.

10. (c)

When the instrument is at A,

Apparent difference in elevation between A and B

$$= 2.860 - 1.285$$

$$= 1.575 \text{ m} \quad \text{(A being higher)}$$

When the instrument is at B,

Apparent difference in elevation between A and B

$$= 2.220 - 0.860$$

$$= 1.360 \text{ m} \quad \text{(A being higher)}$$

$$\text{True difference in elevation} = \frac{1.575 + 1.360}{2} = 1.468 \text{ m}$$

11. (d)

Displacement due to angular error on ground = $l \sin\alpha = 15 \sin\alpha$

Displacement due to linear error on ground = $\frac{l}{r} = \frac{15}{20} = 0.75$

$$\text{Combined error on ground} = \sqrt{(15\sin\alpha)^2 + (0.75)^2}$$

$$\text{Combined error in plotting on plan} = \frac{1}{30}\sqrt{(15\sin\alpha)^2 + (0.75)^2}$$

Hence,
$$\frac{1}{30}\sqrt{(15\sin\alpha)^2 + (0.75)^2} = 0.025$$

$$\Rightarrow \quad \alpha = 0°$$

So, no angular error can be permitted.

12. (a)

$$\Delta h = \frac{(H - h_{bottom})^2 \Delta p}{(H - h_{bottom})\Delta p + b_m H}$$

$$\Rightarrow \quad H - h_{\text{bottom}} = 3000 - 200 = 2800 \text{ m}$$

$$\Delta p = 20 \text{ mm}$$

$$b_m = 110.5 \text{ mm}$$

$$\therefore \quad \Delta h = \frac{(2800)^2 \times 20}{(2800 \times 20) + (110.5 \times 3000)} = 404.65 \text{ m}$$

13. (c)

In a closed traverse with no local attraction,

$$FB - BB = 180°$$

Since station 'X' is free from local attraction and therefore FB_{XY} and BB_{ZY} are correct.

$\therefore$ $FB_{XY} = 35°$ and $BB_{XY} = 216°$

But $BB_{XY} - FB_{XY} = 216 - 35° = 181° \neq 180°$

$\therefore$ A correction of $-1°$ is to be applied at station Y,

$\therefore$ $FB_{YZ} = 116° - 1° = 115°$

But $BB_{YZ} - FB_{YZ} = 293° - 115° = 178° \neq 180°$

$\therefore$ A correction of $+2°$ is to be applied at Z

$\therefore$ The correct FB of ZY = $293° + 2° = 295°$

14. (c)

- Prevention of earthquakes cannot be achieved by remote sensing.
- Active sensor utilises man-made sources of energy for data collection.

15. (b)

Let the vertical angle be θ.

True horizontal distance, $D = kS\cos^2\theta$

Sloping distance, $L = kS$

$$\frac{\text{Sloping distance}}{\text{Horizontal distance}} = \frac{kS}{kS\cos^2\theta} = \sec^2\theta$$

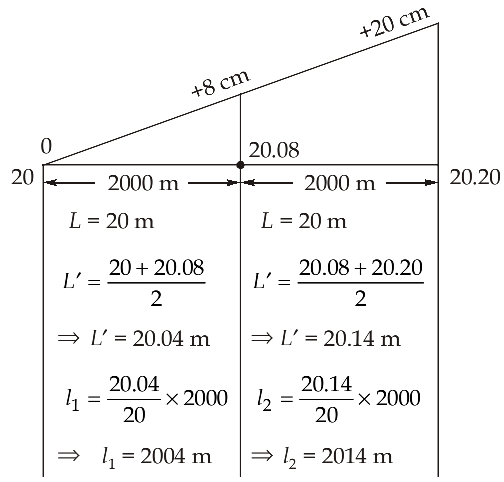
Permissible error is 1 in 300

Hence, $$\frac{L}{D} = \frac{300+1}{300} = \frac{301}{300}$$

$\therefore$ $$\sec^2\theta = \frac{301}{300}$$

$\Rightarrow$ $$\theta = 3°18'15''$$

16. (d)



$\therefore$ $$l = l_1 + l_2 = 2004 + 2014 = 4018 \text{ m}$$

17. (b)

The horizontal distance (D) between the vertical axis and staff is given as

$$D = \left(\frac{f}{i}\right)(s) + (f + d)$$

where, f = focal length = 180 mm

i = Spacing between upper and lower lines of diaphragm axis = 5 mm

d = distance between the vertical axis of the tachometer and the optical centre of the object glass = 120 mm

s = 4 – 2 = 2 m

$\therefore$ $$D = \left(\frac{180}{5}\right)(2) + (0.18 + 0.12) = 72.3 \text{ m}$$

18. (a)

The scale expressed as R.F. is given by

$$R = \frac{f}{H-f}$$

$$\Rightarrow \quad \frac{1}{8000} = \frac{(20/100)}{(H-1500)}$$

$$H - 1500 = \frac{20 \times 8000}{100}$$

$$\Rightarrow \quad H = 1600 + 1500 = 3100 \text{ m}$$

19. (c)

The first section and the second section have odd number of ordinates, and therefore, Simpson's rule is directly applicable.

The third section has 4 ordinates (even number); the rule is applicable for the first three ordinates only

$$\Delta_1 = \frac{15}{3}\left[(7.60+10.6)+4(8.5+12.8)+2(10.7)\right] = 624 \text{ m}^2$$

$$\Delta_2 = \frac{10}{3}\left[(10.6+8.3)+4(9.5)\right] = 189.7 \text{ m}^2$$

$$\Delta_3 = \frac{20}{3}\left[(8.3+6.4)+4(7.9)\right]+\frac{20}{2}(6.4+4.4) = 308.6+108 = 416.6 \text{ m}^2$$

$$\Delta = 624 + 189.7 + 416.6 = 1230.3 \text{ m}^2$$

20. (d)

The difference in elevation between the vane and instrument axis

$$D \tan\alpha = 3000 \times \tan 5°36' = 294.153 \text{ m}$$

Combined correction due to curvature and refraction

$$h = 0.0673D^2, \qquad (D \text{ is in km})$$

$$= 0.0673 \times 3^2 = 0.606 \text{ m}$$

(here correction will be substractive)

So, difference in elevation between the vane and instrument axis

$$\therefore \quad h = 294.153 - 0.606$$

$$= 293.547 \text{ m}$$

$$\text{RL of instrument axis} = 436.050 + 2.865 = 438.915 \text{ m}$$

$$\therefore \quad \text{RL of vane} = \text{RL of instrument axis} - h$$

$$= 438.915 - 293.547$$

$$= 145.368 \text{ m}$$

$$\therefore \quad \text{RL of staff station } Q = 145.368 - 2 = 143.368 \text{ m}$$

21. (b)

$$\frac{\text{Length of long chord}}{\text{Tangent length}} = \frac{2R\sin\Delta/2}{R\tan\Delta/2}$$

$$\frac{2\sin 45°}{\tan 45°} = 1.414$$

22. (c)

As tape is pulled under a standard pull of 180 N, so there will be no pull (tension) correction. Thus only sag correction is applicable.

$$\text{Sag correction} = \frac{W^2 l}{24P^2} = \frac{(30)^2 \times 100}{24 \times 180^2} \simeq 0.116 \text{ m} \qquad \text{(Negative correction)}$$

$\therefore$ Correct distance between the ends of tape = 100 – 0.116 = 99.884 m

23. (a)

Let the length and bearing of line *EA* are 'l' and 'θ' respectively

In a closed traverse,

$$\sum \text{Lattitudes} = 0 \text{ and } \sum \text{Departures} = 0$$

Considering, $\sum \text{Lattitudes} = 0$

$$\Rightarrow 204 \cos 87°30' + 226 \cos 20°20' + 187 \cos 280° + 192 \cos 210°03' + l \cos\theta = 0$$

$$\Rightarrow l\cos\theta = -87.095 \text{ m} \qquad \text{...(i)}$$

Considering, $\sum \text{Departures} = 0$

$$\Rightarrow 204 \sin 87°30' + 226 \sin 20°20' + 187 \sin 280° + 192 \sin 210°03' + l \sin\theta = 0$$

$$\Rightarrow l\sin\theta = -2.03 \text{ m} \qquad \text{...(ii)}$$

$$\therefore l^2 \sin^2\theta + l^2 \cos^2\theta = (2.03)^2 + (87.095)^2$$

$$\therefore l = 87.12 \text{ m}$$

24. (c)

25. (a)

True difference of levels between *A* and *B* is given by,

$$H = \frac{(h_b - h_a) + (h'_b - h'_a)}{2}$$

where, h_b = reading on staff at *B* when instrument is at *A*

h_a = reading on staff at *A* when instrument is at *A*

h'_b = reading on staff at *B* when instrument is at *B*

h'_a = reading on staff at *A* when instrument is at *B*

$$\Rightarrow H = \frac{(1.64 - 1.05) + (1.53 - 0.90)}{2}$$

$$\Rightarrow H = 0.61 \text{ m}$$

$$\therefore \text{R.L. of } B = \text{R.L. of } A - H = 126.49 - 0.61$$

$$= 125.88 \text{ m}$$

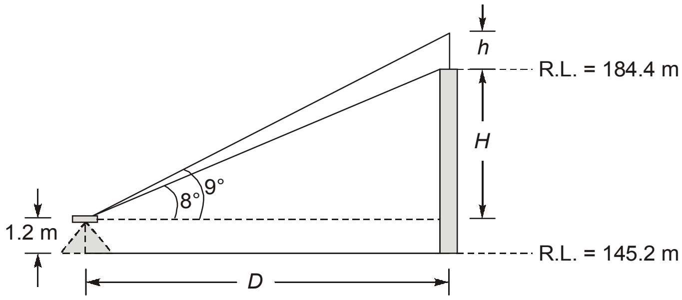
26. (c)

$$\text{Volume} = h\left[\frac{A_1 + A_n}{2} + A_2 + A_3 + A_4\right]$$

$$= 5\left[\frac{60 + 1000}{2} + 180 + 330 + 650\right]$$

$$= 8450 \text{ ha-m}$$

27. (b)



Height of building above instrument,

$$H = (184.4 - 145.2) - 1.2$$
$$= 38 \text{ m}$$
$$\tan 8^\circ = \frac{H}{D}$$
$$\Rightarrow \quad D = \frac{H}{\tan 8^\circ} \quad \text{...(i)}$$
$$\tan 9^\circ = \frac{H+h}{D} \quad \text{...(ii)}$$

From (i) and (ii),

$$\Rightarrow \quad \tan 9^\circ = \frac{H+h}{H}\tan 8^\circ$$
$$\therefore \quad h = 4.825 \text{ m} = 48.25 \text{ decimeter}$$

28. (c)

Stations A and B are free from local attraction

$\therefore$ FB of BC is correct

$\therefore$ Correct BB of BC = 360° – (180° – 139°30′) = 319°30′

But BB of BC = 317°00′

$\therefore$ Correction at station C = 2°30′

$\therefore$ Correct FB of CD = 215°15′ + 2°30′ = 217°45′

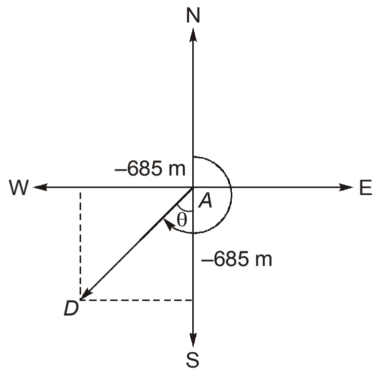
$\therefore$ Correct BB of CD = 217°45′ – 180°00′ = 37°45′

But BB of CD = 36°30′

$\therefore$ Correction at station D = 1°15′

$\therefore$ Correct FB of DE = 208°00′ + 1°15′ = 209°15′

29. (d)



$$\Sigma L = 0$$

$$-73.0 + 535.0 + 223.0 + L_{DA} = 0$$

$$L_{DA} = -685.0 \text{ m}$$

Also $$\Sigma D = 0$$

$$440.5 + 313.0 - 68.5 + D_{DA} = 0$$

$$D_{DA} = -685.0 \text{ m}$$

$$\therefore \quad \tan\theta = \frac{-685.0}{-685.0} = 1$$

$$\therefore \quad \theta = 45°$$

$\therefore$ Reduced bearing of DA = S45°W

WCB of DA = 270° – 45° = 225°

30. (b)

Height of instrument = BM + Back sight

Since the staff is inverted, the back sight will be negative

$\therefore$ Height of instrument = 150 + (–3.862) = 146.138 m

Now, Elevation of plinth = Height of instrument – Fore sight

= 146.138 – 2.531 = 143.607 m

■■■■