5 CHAPTER

Theodolite

Q.1 Theodolite is an instrument used for
(a) tightening the capstan-headed units of level tube
(b) measurement of horizontal angles only
(c) measurement of vertical angles only
(d) measurement of both horizontal and vertical angles

Q.2 If the lower clamp screw is tightened and upper clamp screw is loosened, the theodolite may be rotated
(a) on its outer spindle with a relative motion between the vernier and graduated scale of lower plate
(b) on its outer spindle without a relative motion between the vernier and graduated scale of lower plate
(c) on its inner spindle with a relative motion between the vernier and the graduated scale of lower plate
(d) on its inner spindle without a relative motion between the vernier and the graduated scale of lower plate

Q.3 The error due to eccentricity of inner and outer axes can be eliminated by
(a) reading both verniers and taking the mean of the two readings
(b) taking both face observations and taking the mean of the two readings
(c) double sighting
(d) taking mean of several readings distributed over different portions of the graduated circle

Q.4 The multiplying constant of a theodolite is
(a) f/i (b) $(f + d)$
(c) $\frac{f}{i}+d$ (d) $\frac{f}{d}+i$

Q.5 While measuring horizontal angles by the method of repetition with a theodolite, readings are taken on both the verniers. Which one of the following errors will be eliminated by reading both the verniers?
(a) Error due to eccentricity of the centres
(b) Error due to imperfect adjustment of the line of collimation
(c) Effort due to imperfect adjustment of the horizontal axis
(d) Error due to imperfect graduations

Q.6 Consider the following operations in a spire test:
1. Depress telescope and sight a point on the ground nearer to the instrument
2. Clamp horizontal plates
3. Sight a well-defined high point on a high building
4. Change face and repeat the procedure.

The correct sequence of these operations is
(a) 1, 2, 3, 4 (b) 3, 1, 2, 4
(c) 3, 2, 1, 4 (d) 2, 1, 3, 4

Q.7 In theodolite traversing, for the calculation of independent rectangular coordinates from the field observations, some of the computations are indicated below
1. Computation of reduced bearing of each traverse leg
2. Calculation of the closing error
3. Balancing of consecutive coordinates
4. Calculation of consecutive coordinates

The correct sequence in which these computations are to be made is
(a) 1, 2, 3, 4 (b) 2, 4, 3, 1
(c) 1, 4, 2, 3 (d) 3, 1, 4, 2

Q.8 Which one of the following is carried out by two theodolite method?
(a) Circular curve ranging
(b) Tacheometric survey
(c) Geodetic survey
(d) Astronomical survey

Q.9 The error which occurs when image formed by objective is not in the same plane with cross-hairs of the telescope is
(a) Aberration (b) Parallax
(c) Applanation (d) Achromatism

Q.10 The error in the horizontal circle readings due to the line of collimation not being perpendicular to the trunnion axis is eliminated by
(a) taking readings on the different parts of horizontal circle
(b) taking readings on both the faces
(c) removing the parallax
(d) transiting the telescope

Q.11 When a theodolite is in proper adjustment, which of the following conditions between fundamental lines are satisfied?
1. Axis of the plate level is perpendicular to the vertical axis.
2. The line of collimation is at right angles to the vertical axis.
3. The axis of the altitude level is parallel to the line of collimation when it is horizontal and the vertical circle reads zero.

Select the correct answer using the codes given below:
Codes:
(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1, 2 and 3

Q.12 The process of turning the telescope about the vertical axis in horizontal plane is known as
(a) transiting (b) reversing
(c) swinging (d) plunging

Q.13 The main plate of a theodolite is divided into 1080 equal divisions, 60 divisions of the vernier coincide exactly with 59 division of the main plate. The least count of the theodolite is
(a) 5 seconds (b) 15 seconds
(c) 10 seconds (d) 20 seconds

Q.14 By the method of repetition, the observational errors, eliminated are:
(a) Line of collimation error
(b) Trunnion axis error
(c) Graduational error
(d) Parallox error

Q.15 A theodolite fitted with an optical plummet
(a) increases the accuracy of reading of angles
(b) increases the accuracy of centering
(c) increases the accuracy of bisection of signal
(d) helps in the process of levelling

Q.16 The imaginary line joining the centre of diaphragm and optical centre of the objective of a telescope is called
(a) Axis of telescope (b) Line of collimation
(c) Line of sight (d) None of these

Q.17 The error eliminated by face left and face right observation in a theodolite is
(a) index error (b) eccentricity error
(c) Both (a) and (b) (d) None of these

Q.18 The latitude coordinate relates to
(a) North and South (b) North and East
(c) North and West (d) East and West

Q.19 ABCD is a regular parallelogram plot of land whose angle BAD is 60°. If the bearing of the line AB is 30°, then the bearing of CD is
(a) 90° (b) 210°
(c) 120° (d) 270°

Q.20 Centering error of a theodolite produces an error
(a) in all angles equally
(b) which does not vary with the direction or pointing
(c) which varies with the direction of pointing and inversely with the length of sight
(d) None of these

Q.21 A theodolite is said to be in perfect adjustment if
(a) rotation axis is vertical to the transit axis
(b) transit axis is perpendicular to line of collimation
(c) line of collimation sweeps out a vertical plane while the telescope is elevated or depressed
(d) All of the above

Q.22 Which of following error is not eliminated by method of repetition for horizontal angle measurement?

(a) Errors due to eccentricity of verniers

(b) Errors due to inaccurate graduation

(c) Error due to displacement of signals

(d) Errors due to wrong adjustment of line of collimation and trunion axis

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Answers **Theodolite**

1. (d)	2. (c)	3. (a)	4. (a)	5. (a)	6. (c)	7. (c)	8. (a)	9. (b)	10. (b)
11. (d)	12. (c)	13. (d)	14. (a)	15. (b)	16. (b)	17. (a)	18. (a)	19. (c)	20. (c)
21. (d)	22. (c)								

Explanations **Theodolite**

3. (a)

Error due to eccentricity of inner and outer axes means that the centre of graduated horizontal circle does not coincide with the centre of vernier plate.

9. (b)

Aberration leads to formation of indistinct (or blurred) image of an object or an indistinct image with prismatically coloured images. They are of two types viz. spherical aberration and chromatic aberration.

Achromatism is the absence of chromatic aberration. Applanation is the absence of spherical aberration. These two are not the errors but the desired characteristics of a telescope.

Parallax is the defect of telescope due to which image formed by objective is not in the same plane as that of cross-hairs.

13. (d)

$$\text{Least count} = \frac{S}{n}$$

Where, S = division of main scale

n = total no. of division of main scale divided into $(n-1)$ division of vernier scale

$$S = \frac{360°}{1080} = 0.33° \text{ or } 1200 \text{ sec}$$

$$\therefore \quad \text{Least count} = \frac{1200}{60} = 20 \text{ sec}$$

Hence option (d) is correct.

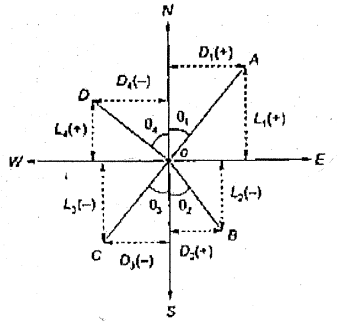
17. (a)

If the vertical circle verniers do not read zero when the line of sight is horizontal, the vertical angle measured will be in correct. The error is known as the index error and this can be eliminated by taking both face observations or by applying index correction.

The error is introduced when the zeros of the vernier are not at the ends of the same diameter. Thus, the difference between the two vernier readings will not be 180°, but there will be a constant difference of other than 180°. The error can be eliminated by reading both the vernier and taking the mean of the two.

Hence option (a) is correct.

18. (a)



The latitude of survey line may be defined as its coordinate length measured parallel to the meridian direction (i.e., N-S direction).

The latitude (L) of the line is positive when measured upward and negative when measured southward (downward)

Hence option (a) is correct.

19. (c)

The bearing of AB is 30°

∴ It is less than 90° we have to add 180° to it

i.e., $30° + 180° = 210°$

22. (c)

Errors due to displacement signals are not eliminated in method of repetitions for horizontal angle measurement.

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