



# PRACTICE QUESTIONS

## for SSC-JE : CBT-2

### Surveying

### Civil Engineering



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- Q.1** In order to determine the natural features such as valleys, rivers, lakes etc. the surveying preferred is :
- City Surveying
  - Location Surveying
  - Cadastral Surveying
  - Topographical Surveying
- Q.2** An old map was plotted to a scale of 40 m to 1 cm. Over the years, this map has been shrinking and a line originally 20 cm long is only 19.5 cm long at present. Shrunk scale is given by :
- 1 cm = 39.80 m
  - 1 cm = 42.80 m
  - 1 cm = 41.02 m
  - 1 cm = 40.80 m
- Q.3** In chain surveying tie lines are primarily provided
- To check the accuracy of the survey
  - To take offsets for detailed survey
  - To avoid long offsets from chain lines
  - To increase the number of chain lines
- Q.4** The 100 m tape is suspended between the ends under a pull of 200 N. The weight of the tape is 30 N. The correction for sag will be
- 0.1037 m
  - 0.09375 m
  - 0.7565 m
  - 0.0892 m
- Q.5** Ranging is a process of :
- Establishing intermediate points on a straight line.
  - Determining the distance between the inaccessible points.
  - Measuring the horizontal distance.
  - Bisecting an object.
- Q.6** Which of the following is an obstacle to ranging but not chaining?
- River
  - Building
  - Pond
  - Hill
- Q.7** A line  $PQ$  in an old map had magnetic bearing of  $N60^\circ E$  when the local magnetic declination was  $2^\circ E$ . If the magnetic declination is now  $3^\circ W$ , what would be the magnetic bearing of the line  $PQ$  now?
- $N61^\circ W$
  - $N65^\circ E$
  - $N63^\circ E$
  - $N55^\circ E$
- Q.8** In the prismatic compass, the graduations starts from zero, marked at the \_\_\_\_\_ end of the needle and run \_\_\_\_\_.
- North, Clockwise
  - South, Anticlockwise
  - South, Clockwise
  - North, Anticlockwise
- Q.9** The operation of revolving the telescope through  $180^\circ$  in a vertical plane about its horizontal axis is known as :
- Transiting
  - Swinging
  - Setting
  - Centering
- Q.10** In any closed traverse, if the survey work is error free then :
- S1 : The algebraic sum of all the latitudes should be equal to zero.
- S2 : The sum of the northings should be equal to the sum of the southings.

Choose the correct option(s) :

- (a) S1 true, S2 false (b) S1 false, S2 true  
(c) S1 false, S2 false (d) S1 true, S2 true

**Q.11** If the focal length of the object glass is 25 cm and the distance between the optical centre of the object glass and the vertical axis of the theodolite is 15 cm, then additive constant is

- (a) 0.3 (b) 0.1  
(c) 0.4 (d) 0.6

**Q.12** In case of angular measurements being more precise than the linear measurements, the traverse can be balanced by

- (a) Theodolite correction  
(b) Bowditch method  
(c) Transit method  
(d) Graphical method

**Q.13** The length of long chord and tangent of a circular curve of radius 500 m will be equal, if the angle of deflection is

- (a)  $30^\circ$  (b)  $90^\circ$   
(c)  $60^\circ$  (d)  $120^\circ$

**Q.14** Which of the following curves is usually NOT adopted for transitioning in horizontal alignment?

- (a) Reverse (b) Lemniscate  
(c) Cubic spiral (d) Cubic parabola

**Q.15** The process of determining the location of the station (on the map) occupied by the plane table is called as :

- (a) Intersection (b) 3-point problem  
(c) Traversing (d) Resection

**Q.16** An instrument was set up at A and the angle of elevation of the top of an electric pole BC was  $24^\circ 36'$ . The horizontal distance between A and B, the foot of the pole was 400 m. If the staff reading held on a B.M (RL = 100 m) was 1.846 m, with the telescope in horizontal plane. Then, the RL of the top of the pole is \_\_\_\_\_. (Use  $\tan 24^\circ 30' = 0.46$ )

- (a) 284.846 m (b) 285.846 m  
(c) 287.846 m (d) 289.846 m

**Q.17** The following offsets were taken from a chain line to an irregular boundary line at an interval of 10 m : 0, 2.50, 3.50, 5.00, 4.60, 3.20, 0 m

The area (in  $m^2$ ) between the chain line, the irregular boundary line and the end offsets by the average ordinate formula is

- (a) 161.14 (b) 188  
(c) 196.66 (d) 192

**Q.18** The instrument used for reducing a plan is known as :

- (a) Clinometer (b) Planimeter  
(c) Pantagraph (d) Sextant

**Q.19** A staff reading taken on a point of known elevation is called

- (a) Fore sight  
(b) Back sight  
(c) Intermediate sight  
(d) Front sight

**Q.20** The process of determining the elevations of points at short measured interval along a fixed line such as centre line of railway, highway and canal etc. is known as

- (a) reciprocal levelling  
(b) Differential levelling  
(c) Invert levelling  
(d) Profile levelling

**Q.21** In levelling, the effect of refraction may be taken as \_\_\_\_\_ of that due to curvature.

- (a) One-half (b) One-third  
(c) One-fifth (d) One-seventh

**Q.22** Weight of measurement is

- (a) directly proportional to variance  
(b) inversely proportional to standard deviation

- (c) directly proportional to standard deviation  
 (d) inversely proportional to variance

- Q.23** Two angles  $A$  and  $B$  are  $A = 32^{\circ}16'18''$  of weight 3 and  $B = 25^{\circ}14'12''$  of weight 2. The weight of  $(A - B)$  is  
 (a) 1.2 (b) 1.4  
 (c) 1.5 (d) 2
- Q.24** If the cross-sectional area of an embankment at 30 m intervals are 20, 40, 60, 50 and 30  $\text{m}^2$  then the volume of the embankment on the basis of prismoidal rule is  
 (a) 5300  $\text{m}^3$  (b) 8300  $\text{m}^3$   
 (c) 9300  $\text{m}^3$  (d) 9400  $\text{m}^3$
- Q.25** Closed contours, with higher value in-ward, represents  
 (a) depression (b) hill  
 (c) plain surface (d) none of these
- Q.26** If the intercept on a vertical staff is observed as 0.75 m from a tachometer, the horizontal distance between tachometer and staff station is  
 (a) 7.5 m (b) 25 m  
 (c) 50 m (d) 75 m
- Q.27** The check available in levelling is as follows:  
 (a)  $S \text{ Rise} - S \text{ Fall} = \text{Last R.L} - \text{First R.L}$   
 (b)  $S \text{ B.S} - S \text{ F.S} = S \text{ Rise} - S \text{ Fall}$   
 (c)  $S \text{ B.S} - S \text{ I.S} = \text{Last R.L} - \text{I.R.L}$   
 (d) Only (a) and (b) is correct
- Q.28** Which one of the following gives the correct distance between the light house and a ship, when the lighthouse whose height 100 m is visible just above the horizon from the ship?  
 (a) 30.68 km (b) 36.50 km  
 (c) 38.54 km (d) 40.54 km
- Q.29** Given that  
 Scale of photograph is 1 cm = 100 m  
 Size of photograph = 23cm  $\times$  23cm  
 Area to be covered = 150 sq.km  
 Longitudinal overlap = 60%  
 Side overlap = 30%  
 The total number of photograph required for covering the above area is  
 (a) 143 (b) 101  
 (c) 58 (d) 43
- Q.30** In Plane Table surveying, the operation which must be carried out is  
 (a) Resection (b) Orientation  
 (c) Intersection (d) Radiation

## Answer Keys

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

## Detailed Solutions

1. (d)

**Topographical Surveying** : Done to determine the natural features of a country

**Cadastral Surveying** : Conducted in order to determine the boundaries of fields, estates, houses etc.

**City Surveying** : Carried out to locate the premises, streets, water supply and sanitary systems etc.

2. (c)

$$(R.F.)_{\text{original scale}} = \frac{1}{4000}$$

$$\text{Shrinkage factor} = \frac{19.5}{20} = 0.975$$

$$\begin{aligned} (R.F.)_{\text{shrunk scale}} &= (\text{Shrinkage Factor}) \times (R.F.)_{\text{original scale}} \\ &= 0.975 \times \frac{1}{(4000)} = \frac{1}{4102.56} \end{aligned}$$

$$\Rightarrow 1 \text{ cm} = 41.02 \text{ m}$$

3. (c)

**Tie Lines** : If the distance of the point of detail from the chain line is very large, long offsets have to be taken, the tie lines are the lines run to locate details to avoid long offsets.

4. (b)

Correction for sag

$$\begin{aligned} C_s &= \frac{w^2 L^3}{24P_m^2} = \frac{W^2 L}{24P_m^2} \\ &= \frac{(30)^2 \times (100)}{24 \times (200)^2} = 0.09375 \text{ m} \end{aligned}$$

5. (a)

The process of marking a number of intermediate points on a survey line joining two stations in the field so that the length between them may be measured accurately, is called ranging.

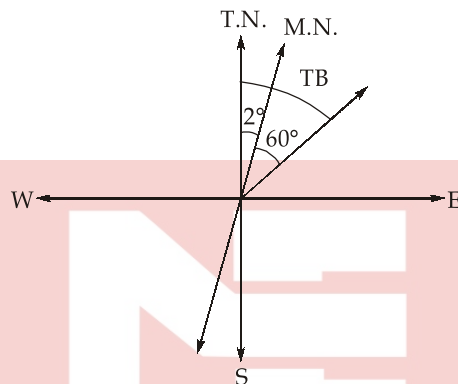
6. (d)

**Obstacle which obstruct ranging but not chaining :** In this type of obstacle, the ends of the chain line are not intervisible. Such obstacles are generally met in undulating terrain where area consists of rising grounds, intervening hills or undulations.

**Note:**

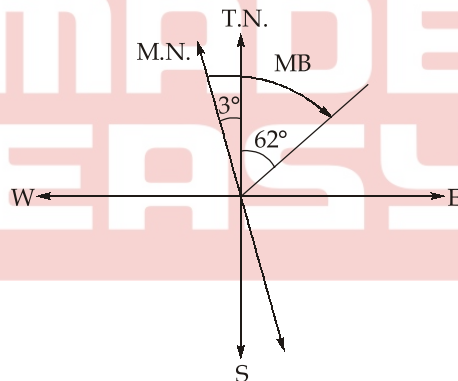
**Obstacle which obstruct chaining but not ranging:** The typical type of obstructions under this category are generally larger water bodies, i.e., lakes, ponds, rivers etc.

7. (b)



True bearing of line =  $N62^{\circ}E$

Now, when declination is  $3^{\circ}W$ .



Magnetic bearing of line =  $N65^{\circ}E$

8. (c)

In prismatic compass, the graduations on the aluminium ring increases clockwise from  $0^{\circ}$  to  $360^{\circ}$ , with the zero of the graduations coinciding with the south end of the needle.

9. (a)

**Transit Theodolite :** A theodolite is said to be a transit one when its telescope can be rotated through  $180^{\circ}$  in a vertical plane about its horizontal axis.

**Swinging :** Process of turning the telescope in horizontal plane.

10. (d)

In any closed traverse, if the survey is error free

$$\Sigma L = 0$$

(L = Latitude)

⇒ Sum of northing = Sum of southing

**Note:** Also  $\Sigma D = 0$

(D = Departure)

Sum of easting = Sum of westing

11. (c)

Given :

$$f = 25 \text{ cm}$$

$$d = 15 \text{ cm}$$

∴

$$\text{Additive constant} = (f + d)$$

$$= 25 + 15 = 40 \text{ cm}$$

$$= 0.40$$

12. (c)

**Transmit Method :** Employed where angular measurements are more precise than the linear measurements.

**Bowditch Method :** This method is used to balance a traverse, where linear and angular measurements are of equal precision.

13. (d)

$$\text{Length of long chord} = 2R \sin \frac{\Delta}{2}$$

$$\text{Length of tangent} = R \tan \frac{\Delta}{2}$$

$$\text{Now, } 2R \sin \frac{\Delta}{2} = R \tan \frac{\Delta}{2}$$

$$\Rightarrow \cos \frac{\Delta}{2} = \frac{1}{2}$$

$$\Rightarrow \frac{\Delta}{2} = 60^\circ$$

$$\Delta = 120^\circ$$

14. (a)

There are mainly three types of transition curves, namely

(i) Cubic Spiral

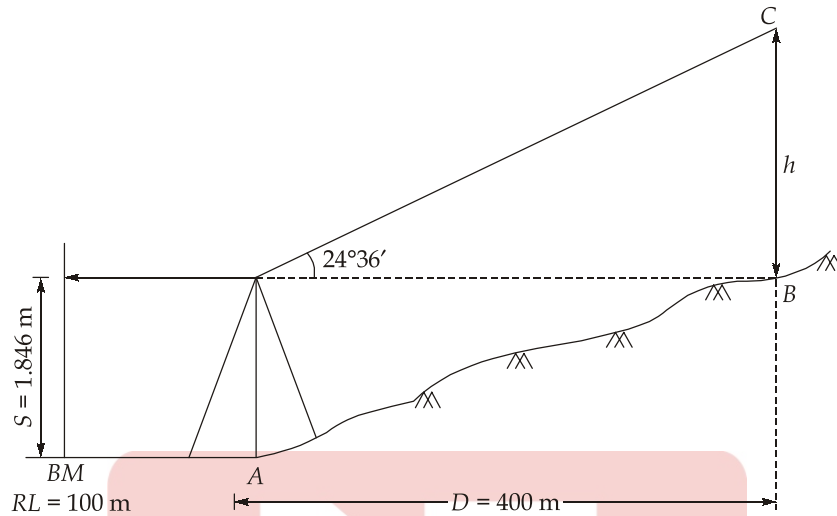
(ii) Cubic Parabola

(iii) The Lemniscate Curve

15. (d)

Resection is the method of locating the station occupied by the plane table when the position of that station is not being plotted from other station.

16. (b)



$$\text{From figure, } \tan(24^\circ 36') = \frac{h}{AB} = \frac{h}{400} = 0.46$$

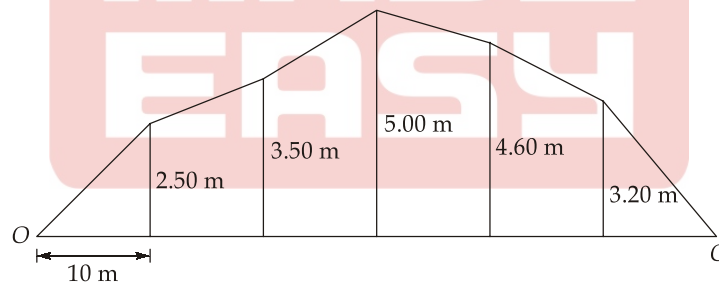
$$\Rightarrow h = 400 \times 0.46 = 184 \text{ m}$$

$\therefore$  R.L. of top of the pole

$$= \text{R.L. of B.M} + S + h$$

$$= 100 + 1.846 + 184 = 285.846 \text{ m}$$

17. (a)



$$\text{No. of divisions } (n) = 6, d = 10 \text{ m}$$

$$\therefore \text{Length of base line} = 6 \times 10 = 60 \text{ m}$$

$$\text{No. of ordinates} = (n + 1) = 6 + 1 = 7$$

$$\therefore \text{Required area} = \frac{\text{Sum of ordinates}}{\text{No. of ordinates}} \times \text{Base Length}$$

$$= \frac{2.50 + 3.50 + 5 + 4.6 + 3.2}{7} \times 60$$

$$= \frac{18.8}{7} \times 60 = 161.14 \text{ m}^2$$



18. (c)

**Pantagraph** : It is an instrument used in the office to enlarge or reduce a plan already drawn.

**Clinometer** : It is an instrument used for determining the slope of the ground for setting out gradients and for measuring vertical angles.

**Sextant** : It is an instrument used for measuring angles from a boat in hydrographic surveying.

**Planimeter** : The area of a plan may be determined with the help of planimeter.

19. (b)

**Back Sight** : It is the reading taken on a staff held at a point of known elevation or at the point whose elevation has already been determined.

The back sight is usually the first reading taken after setting up the instrument.

**Fore Sight** : It is the reading taken on the staff either held at the last point whose elevation is required or held at the turning point just before shifting the instrument.

The fore sight is used to determine the elevation of the staff station.

**Intermediate Sight** : It is the reading taken on a staff held at a point whose elevation is required.

20. (d)

**Profile Levelling** : This is a type of differential levelling done for the purpose to determine the elevations of the ground surface along a fixed line. The fixed line is generally the centreline of a proposed route, such as road, canal, railway line, sewer line. The profile levelling is also called the longitudinal levelling.

21. (d)

The effect of refraction is 1/7th that of the curvature but of opposite sign.

Correction for refraction

$$C_r = \frac{1}{7} \times \frac{d^2}{2R} \text{ (+ve)}$$

23. (a)

$$\text{Angle, } A = 32^\circ 16' 18''$$

$$\text{Weight}_A = 3$$

$$\text{Angle, } B = 25^\circ 14' 12''$$

$$\text{Weight}_B = 2$$

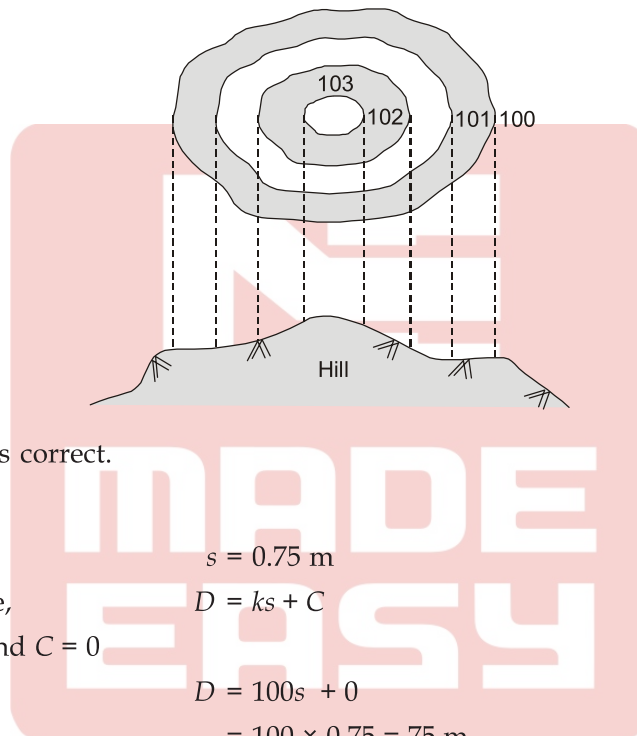
$$\begin{aligned} \text{Then weight of } (A - B) &= \frac{1}{\frac{1}{w_A} + \frac{1}{w_B}} = \frac{1}{\frac{1}{3} + \frac{1}{2}} \\ &= \frac{6}{5} = 1.2 \text{ i.e. (a) is correct} \end{aligned}$$

24. (a)

$$\begin{aligned}
 V &= \frac{d}{3} [(A_1 + A_n) + 4(A_2 + A_4 + \dots) + 2(A_3 + A_5 + \dots)] \\
 &= \frac{30}{3} [(20 + 30) + 4(40 + 50) + 2(60)] \\
 &= 5300 \text{ m}^3
 \end{aligned}$$

25. (b)

Example:



Hence option (b) is correct.

26. (d)

$$s = 0.75 \text{ m}$$

Horizontal distance,

$$D = ks + C$$

Generally  $k = 100$  and  $C = 0$  $\therefore$ 

$$D = 100s + 0$$

$$= 100 \times 0.75 = 75 \text{ m}$$

Hence option (d) is correct.

27. (d)

Check available for levelling are:

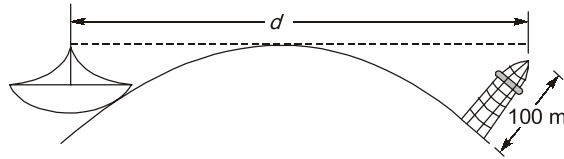
$$(i) \Sigma B.S - \Sigma F.S = \text{Last R.L} - \text{First RL}$$

$$(ii) \Sigma \text{Rise} - \Sigma \text{fall} = \text{Last RL} - \text{First RL}$$

$$(iii) \Sigma B.S - \Sigma F.S = \Sigma \text{Rise} - \Sigma \text{fall}$$

Hence option (d) is correct.

28. (c)



$$d = 3.85\sqrt{h}$$

$$d = 3.85\sqrt{100}$$

$$= 38.5 \text{ km}$$

29. (b)

Effective size of photograph

$$= (1 - w_L) \times L \times (1 - w_B) \times B$$

$$= (1 - 0.6) 23 \times (1 - 0.3) \times 23$$

$$= 148.12 \text{ cm}^2$$

Area covered by one photograph on land

$$= 148.12 \times (\text{scale})^2$$

$$= 148.12 \times (100)^2$$

$$= 148.12 \times 10^4 \text{ m}^2$$

$$\text{No. of photograph required} = \frac{\text{Area of ground}}{\text{Area covered by one photograph}}$$

$$N = \frac{150 \times (1000)^2}{148.12 \times 10^4}$$

$$N = 101$$

Hence option (b) is correct.

30. (b)

Three must carried out operations of plane table surveying are

1. Fixing the plane table to tripod
2. Setting, levelling, centering and orientation
3. Observations

Hence option (b) is correct.





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