



# POSTAL BOOK PACKAGE 2024

## CONTENTS

---

### CIVIL ENGINEERING

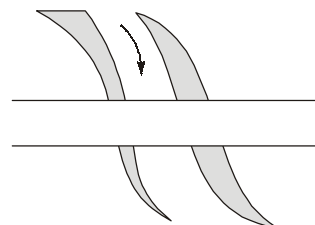
#### Objective Practice Sets

### Surveying and Geology

1.	Introduction .....	2
2.	Linear Measurement .....	6
3.	Chain Surveying .....	13
4.	Compass Surveying .....	18
5.	Theodolite .....	27
6.	Plane Table Surveying .....	31
7.	Levelling and Contouring .....	36
8.	Theory of Errors .....	50
9.	Traverse Computation and Adjustment .....	56
10.	Area and Volume .....	61
11.	Circular Curve .....	64
12.	Transition Curve .....	71
13.	Trigonometry Levelling .....	75
14.	Tacheometry .....	78
15.	Triangulation .....	83
16.	Aerial Surveying .....	86
17.	Astronomy .....	93
18.	Geology .....	99
19.	Remote Sensing, GPS, GIS .....	102

## Introduction

- Q.1** Which of the following is an obstacle to chaining but not to ranging?
- River
  - Hillock
  - Building
  - None of the above
- Q.2** Match **List-I** with **List-II** and select the correct answer using the codes given below the lists:
- List-I**
- Topographical surveys
  - Geodetic surveys
  - Engineering surveys
  - Cadastral surveys
- List-II**
- To obtain data for carrying out any type of project such as roads, railways, water supply, etc.
  - To show boundaries of fields, buildings, etc.
  - To furnish data for size and shape of the Earth
  - To show natural features of the country such as rivers, hills, streams, lakes, roads, bridges, towns etc.
- Codes:**
- |     | A | B | C | D |
|-----|---|---|---|---|
| (a) | 1 | 2 | 3 | 4 |
| (b) | 2 | 1 | 4 | 3 |
| (c) | 1 | 3 | 4 | 2 |
| (d) | 4 | 3 | 1 | 2 |
- Q.3** Which one of the following closely represents the shape of the earth?
- Spheroid
  - Ellipsoid
  - Oblate spheroid
  - Prolate spheroid
- Q.4** The principle of 'working from whole to part' is used in surveying because
- plotting becomes easy
  - survey work can be completed quickly
  - accumulation of errors is prevented
  - All of the above
- Q.5** Geodetic surveying is different from plane surveying because of
- the curvature of earth
  - the large difference of elevations between various points
  - coverage of very large area
  - undulations of very large area
- Q.6** Systematic errors are those errors
- whose effects are cumulative and can be determined
  - which cannot be recognized
  - whose character is not understood
  - whose effect is recognized but character is not understood
- Q.7** Which of the following tape is least affected by temperature changes and is highly precise?
- Linen tape
  - Metallic tape
  - Steel tape
  - Invar tape
- Q.8** **Statement (I):** The fundamental principle of surveying is 'to work from the whole to the part'.  
**Statement (II):** Working from the whole to the part ensures prevention of accumulation of possible errors in survey work over large areas.
- Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
  - Both Statement (I) and Statement (II) are individually true but Statement (II) is NOT the correct explanation of Statement (I)
  - Statement (I) is true but Statement (II) is false
  - Statement (I) is false but Statement (II) is true
- Q.9** The conventional sign shown in figure represents a



- (a) road bridge                      (b) railway bridge                      (c) brass and steel  
(c) canal bridge                      (d) aqueduct                              (d) nickel and steel
- Q.10** The shrinkage factor of an old map is found to be  $\frac{15}{16}$  and the representative fraction of the map is  $\frac{1}{1600}$ . The corrected scale for the map is  
(a)  $\frac{1}{1600}$                               (b)  $\frac{1}{1500}$   
(c)  $\frac{1}{1706.67}$                           (d) None of these
- Q.11** Which of the following scale is largest one?  
(a) 1 cm = 50 m                      (b) 1: 42000  
(c)  $RF = \frac{1}{300000}$                       (d) 1 cm = 5 km
- Q.12** Which one of the following surveys is employed for collecting sufficient data in connection with sewage disposal and water supply works?  
(a) Topographic survey  
(b) Cadastral survey  
(c) Geodetic survey  
(d) Cross-sectioning and profile levelling
- Q.13** For a well-conditional triangle, no angle should be less than  
(a)  $20^\circ$                                   (b)  $30^\circ$   
(c)  $45^\circ$                                   (d)  $60^\circ$
- Q.14** 'Ranging' is the process of  
(a) fixing ranging rods on the extremities of the area  
(b) aligning the chain in a straight line between two extremities  
(c) taking offsets from a chain line  
(d) chaining over a range of mountains
- Q.15** Hydrographic survey deals with the mapping of:  
(a) Large water bodies  
(b) Canal system  
(c) Mountaineous regions  
(d) None of the above
- Q.16** The error due to bad ranging is  
(a) cumulative; positive  
(b) cumulative; negative  
(c) compensating  
(d) cumulative; positive or negative
- Q.17** An invar tape is made of an alloy of  
(a) copper and steel  
(b) brass and nickel
- Q.18** If  $L$  is the measured length of a line, then the compensating errors are proportional to  
(a)  $L^3$                                       (b)  $L^2$   
(c)  $L$                                         (d)  $\sqrt{L}$
- Q.19** Subtense bar is an instrument used for  
(a) Levelling  
(b) Measurement of horizontal distance in plain areas  
(c) Measurement of horizontal distance in undulating areas  
(d) Measurement of angles
- Q.20** Geodetic surveying is undertaken  
(a) for production of accurate maps of wide areas  
(b) for determination of accurate positions on the earth's surface of system of control points  
(c) making use of most accurate instruments and methods of observations  
(d) All of the above
- Multiple Select Questions (MSQ)**
- Q.21** Which of the following statement(s) is/are correct?  
(a) Surveying is the art of determining relative positions of different features on the surface of the earth.  
(b) Surveying is the first step for the execution of any engineering project.  
(c) The object of surveying is the preparation of a map of the area.  
(d) In the absence of accurate maps, it is difficult to layout the alignment of roads, railways and canals.
- Q.22** Which of the following statement(s) is/are TRUE?  
(a) Plumb line is along the direction of gravity.  
(b) Mean Sea Level (MSL) is used as a reference surface for establishing the horizontal control.  
(c) Mean Sea Level (MSL) is a simplification of the Geoid.  
(d) Geoid is an equi-potential surface of gravity.
- Q.23** The plan of a map was photocopied to a reduced size such that a line originally 100 mm measures 90 mm. If the original scale of the plan was 1 : 1000, then which of the following option(s) is/are correct?

- (a) Shrinkage factor is 0.9
- (b) Shrinkage factor is 1.11
- (c) The revised scale is 1 : 1111
- (d) The revised scale is 1 : 900

**Q.24** Which of the following pairs is/are correctly matched?

- (a) Topographical Surveying : To determine the natural features of a country.

- (b) Cadastral Surveying : To determine the boundaries of fields, estates, houses etc.
- (c) Astronomical Survey : Carried out for determining the absolute locations.
- (d) Engineering Survey : To locate the premises, streets, water supply and sanitary systems etc.



### Answers Introduction

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

### Explanations Introduction

1. (a)  
River is an obstacle to chaining but not ranging.
3. (c)  
The actual shape of the earth is an oblate spheroid. It is an ellipsoid of revolution, flattened at the poles and bulging at the equator. The length of the polar axis is about 12, 113.168 km and that of equatorial axis is about 12, 756.602 km. Thus polar axis is shorter than the equatorial axis by about 43.434 km.
4. (c)  
Working from whole to part prevent accumulation of error.
5. (a)  
Geodetic survey is different from plane survey because in geodetic survey curvature of earth is also taken in consideration.
6. (a)  
Systematic error leads to predictable and consistent departure from the true value. They have a cumulative effect which can be eliminated after determining them.
7. (d)  
Invar tape is least affected by temperature. It is because of this only that for precise and accurate surveying invar tape is used.
10. (c)  
Corrected scale  

$$= SF \times RF = \frac{15}{16} \times \frac{1}{1600} = \frac{1}{1706.67}$$
11. (a)  
 (i)  $\frac{1 \text{ cm}}{5000} \Rightarrow 1 \text{ cm} = 50 \text{ meter}$   
 (ii)  $\frac{1}{42000}$   
 (iii)  $\frac{1}{300000}$   
 (iv)  $\frac{1}{500000} = 1 \text{ cm} = 5 \text{ km}$   
 Of all of above (i) is the one having greatest value, so (a) is correct option.
12. (d)  
For cross sections and profile levelling sufficient data for sewage disposal and water supply work is collected.  
Topographic Survey to show features of the country.  
Cadastral Survey used to show boundary of field and building etc.  
Geodetic Survey for size and shape of earth.
13. (b)  
Well condition triangle is one in which all angles are more than 30° and no angle is greater than 120°.

**14. (b)**

When a survey line is longer than chain length, it is necessary to align intermediate point on chain line so that the measurement are along the line. The process of locating intermediate point on survey line is known as ranging.

**15. (a)**

Hydrographic survey measure and describe features which effect maritime navigation, maritime construction etc. like large water bodies.

**16. (a)**

Due to band ranging error is positive and cumulative.

**17. (d)**

Invar tape is an alloy of nickel and steel.

**18. (d)**

Compensating error  $\propto \sqrt{L}$

**19. (c)**

The subtense bar was developed by Mr. Kern. The length of the substance bar is 2 m (6 ft.). It is used for the measurement of comparatively short horizontal distance in undulating areas. A substance bar may be used as a substance base, the length of the bar is made equal to the distance between two targets.

Hence option (c) is correct.

**22. (a, c, d)**

MSL is used for establishing vertical control.

**23. (a, c)**

$$\text{Shrinkage factor} = \frac{90}{100} = 0.9$$

Revised scale = Original Scale  $\times$  Shrinkage Factor

$$= \left( \frac{1}{1000} \times 0.9 \right) = \frac{1}{1111.11}$$

■■■■