

**National Land Commission Secretariat**  
***Cadastral Surveyors Licensing Board***  
**Licensed Surveyor Examination**

**Paper I: Surveying Theory**

**Date:** 13/06/2023      **Time:** 3 hours      **Total marks:**100      **Roll No:** 1 .....

**Read the following instructions carefully:**

1. Invigilator will provide four digits roll no during the examination. Write it clearly on space provided in the question paper and the answer sheet.
2. Question paper will be distributed 15 minutes prior to **10:00 AM**, which shall be commencement of 3 hrs. writing time. This time must be used to check number of pages, read instructions and clarify doubts.
3. Paper consists of 4 pages and 2 parts, A and B. Part A carries 40 marks with 3 sections and Part B carries 60 marks with 6 sections. Answer all questions.
4. Mark is given at the end of each question or section no.
5. Specific instruction is given for each section under part A. Answer accordingly on question paper itself. Read general instruction which is meant for all sections under part B and answer in the answer sheet.
6. You must handover the papers to invigilator before leaving the examination hall.

\*\*\*Good Luck\*\*\*

**Part A**

**Section I-** Circle the correct answer. Each correct answer carries 1 mark. **(10 marks)**

1. What is the primary purpose of cadastral surveying?
  - a) Determining parcel boundaries
  - b) Assessing property values
  - c) Determining taxation values
  - d) Planning land subdivisions
2. Which type of survey marker is formally used for demarcation?
  - a) Stone monument
  - b) Wooden stake
  - c) Iron angel
  - d) None of the above
3. Which surveying technique is used to measure precise vertical distances?
  - a) Traversing
  - b) Differential leveling
  - c) GPS surveying
  - d) Total station surveying
4. What is the purpose of a cadastral map?
  - a) Displaying features
  - b) Showing boundary
  - c) Identifying land use
  - d) Determining area

5. Which type of surveying equipment combines electronic distance measurement and angle measurements?
  - a) Theodolite
  - b) Total station
  - c) Leveling rod
  - d) Transit compass
6. Which coordinate system is commonly used in cadastral surveying?
  - a) Latitude and longitude
  - b) Cartesian coordinates
  - c) UTM coordinates
  - d) Grid coordinates
7. What is the purpose of a traverse survey?
  - a) Determining property boundary
  - b) Creating topographic maps
  - c) Establishing control points
  - d) Measuring elevation changes
8. What is the process of adjusting survey measurements to minimize errors called?
  - a) Calibration
  - b) Compensation
  - c) Randomization
  - d) Adjustment
9. Which type of surveying involves capturing and analyzing aerial photographs for mapping purposes?
  - a) Remote sensing
  - b) Photogrammetry
  - c) GIS surveying
  - d) Cadastral surveying
10. What is the central meridian of Paro Grid coordinate system?
  - a)  $90^\circ$
  - b)  $91^\circ 21' 00''$
  - c)  $89^\circ 21' 00''$
  - d)  $92^\circ 21' 00''$

**Section II**-State whether the given statement is True or False. Write **T** for true and **F** for false. Each correct answer carries 1 mark. **(15 marks)**

1. Cadastral surveying involves the measurement and mapping of underground utility lines. ( )
2. The purpose of cadastral surveying is to create detailed topographic maps of an area. ( )
3. Cadastral surveying is essential for resolving boundary disputes. ( )
4. The GNSS is commonly used in cadastral surveying for precise positioning. ( )
5. Cadastral surveying plays a crucial role in land administration and property taxation. ( )
6. The value of PDOP must be 3-4 as per the guidelines for cadastral surveying using GNSS RTK. ( )
7. Cadastral surveying is primarily concerned with the measurement of horizontal position. ( )
8. Drone is used by the CID, NLCS for cadastral surveying to capture high-resolution aerial imagery. ( )
9. The process of retracing and verifying existing property boundary is known as resurveying. ( )
10. Cadastral surveying is relevant only in urban areas as parcel boundary needs to be well-defined. ( )
11. Geodetic surveying focuses on measuring Earth's shape and size. ( )
12. Demarcation primarily focuses on fragmentation of a parent plot. ( )
13. GIS (Geographic Information System) technology is commonly integrated with cadastral surveying for data management and analysis. ( )

14. Cadastral surveying is only applicable to private land. (    )
15. For Transverse Mercator, map distortion increases as moved away from the central meridian. (    )

**Section III-Fill in the blanks with missing word or words. Each correct answer carries 1 mark. (15 marks)**

1. Licensed surveyor needs to submit..... approved datasets while renewing license.
2. Land owner must be informed.....days prior to the cadastral survey.
3. ....height is recommended for the cadastral surveying as per *RTK guidelines*.
4. Plot with overlapping structure can be realigned if house is constructed before.....
5. CID will audit every surveyor at least once in.....years.
6. Surveyors can be audited with approval of the.....
7. Realignment between registered lands is approved by.....
8. For cadastral survey, distance measurement must be better than.....
9. The..... is a unique identifier assigned to each plot in the cadastral map.
10. One acre is equal to.....square feet.
11. The.....is the process of dividing larger plot into smaller parcels.
12. The value of False Easting for DrukRef03 is.....m.
13. The ellipsoid used for DrukRef03 is .....
14. RTK surveying relies on a ..... for precise and relative positioning.
15. Total stations are equipped with a.....for accurate aiming and alignment.

## **Part B**

**Instruction**-write the section no and question no in the answer sheet before answering.

**Section V. Each question carries 2 marks.**

1. What are the main components of GNSS RTK surveying?
2. What factors need to be considered while using RTK?
3. How does a base station in RTK surveying help improve positioning accuracy?
4. How does RTK surveying differ from other surveying methods?
5. What are the advantages and limitations of using RTK?

**Section VI. Each question carries 2 marks.**

1. What are the main components of a total station?
2. How does a total station work?
3. What is scale factor? Why it is inputted in total station during the cadastral survey? What value of scale factor must be used?
4. What are advantages and limitations of total station surveying?
5. How measurement errors can be mitigated for total station surveying?

**Section VII.**

1. State four roles of the Cadastral Surveyors Licensing board. (2 marks)
2. Outline the prerequisites for applying for registration. (2 marks)
3. Provide information on the timeline and procedure for renewing a license. (2 marks)
4. Explain the steps involved in becoming a registered surveyor. (4 marks)

**Section VIII.**

1. Define datum transformation and discuss its significance. Highlight the effects on the cadastral map. (3 marks)
2. List the benefits of utilizing Druk CORSNET. (2 marks)
3. Enumerate the accomplishments of the National Cadastral Resurvey Project (NCRP). (2 marks)
4. Describe the historical development of cadastral surveying in Bhutan. (3 marks)

**Section IX. *Each question carries 2 marks.***

1. What is a cadastral field book? Why it is important?
2. What type of information is typically recorded in a cadastral field book?
3. How does the use of a cadastral field book contribute to quality control?
4. Can a cadastral field book be used as legal evidence?
5. In the digital era, do you think surveyors should use physical field book? Why?

**Section X. *Each question carries 2 marks.***

1. What factors and considerations should a cadastral surveyor account for when planning the subdivision of a land parcel?
2. What steps would a cadastral surveyor follow to prepare subdivision plans and establish new parcel boundaries in compliance with legal requirements?
3. How would a cadastral surveyor ensure accuracy and precision when demarcating new boundaries during the land subdivision process?
4. What challenges or complexities may arise during the consolidation of multiple land parcels, and how would a cadastral surveyor address them?
5. What documentation and records should a cadastral surveyor provide upon completion of the land subdivision and consolidation process?