

National Land Commission Secretariat
Cadastral Surveyors Licensing Board
Licensed Surveyor Examination

Paper I: Surveying Theory

Date: 29/11/2022 **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 4 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 in question paper itself except section IV. 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. Which of the following projection surface is used in Transverse Mercator Projection?
 - a) Cone
 - b) Cylinder
 - c) Plane
 - d) Sphere
2. Which map property is preserved by the Transverse Mercator Projection?
 - a) Angle
 - b) Area
 - c) Scale
 - d) Distance
3. Digital theodolite was first introduced by
 - a) Leica
 - b) Trimble
 - c) Carl Zeiss Inc.
 - d) Wild

4. What is maximum distance that can be measured with Leica TS06 Total station and round prism (GPR1)?
 - a) 2500 m
 - b) 3000 m
 - c) 3500 m
 - d) 4000 m
5. Maximum positional tolerance permissible in cadastral surveying is-
 - a) 10 Millimeter
 - b) 10 Decimeter
 - c) 0.01 Meter
 - d) 0.1 Meter
6. Who is not a member of the Cadastral Surveyors Licensing Board?
 - a) Secretary
 - b) Directors
 - c) Chief, RLD
 - d) Legal Officer
7. How long a surveying graduate must attend professional training?
 - a) 5 months
 - b) Half year
 - c) 7 months
 - d) 1 year
8. When was first GPS satellites launched into space?
 - a) 1960
 - b) 1974
 - c) 1978
 - d) 1995
9. What is minimum no. of GNSS satellites require to determine position?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
10. Who can approve the plot realignment resulting from the technical issue?
 - a) Secretary
 - b) Director, DoSaM
 - c) Director, DoLaM
 - d) Chief, CID

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. GPS also works well in indoor condition. ()
2. Map distortion of Transverse Mercator Projection remains same as moved away from the central meridian. ()
3. Licensed surveyor needs to submit 3 approved datasets while renewing license. ()
4. Licensed surveyor must not undertake professional responsibilities and duties beyond their competence or authority. ()
5. Payment must be made by a land owner if he/she or representative fails to make presence at the first instance of surveying. ()
6. Land owner must be informed 1 week prior to the cadastral survey. ()
7. PDOP should not exceed 2-3 for cadastral Surveying as per *RTK guidelines*. ()
8. Ellipsoidal height is recommended for cadastral surveying in *RTK guidelines*. ()
9. Plot with overlapping structure can be realigned if house is constructed before 2018. ()
10. Charges for realignment is applicable in all cases. ()
11. Criteria for validating local area plan by the NLCS doesn't include validation of the plot location. ()
12. CID will audit every surveyor at least once in 3 years. ()
13. Surveyors can be audited with approval of the Cadastral Audit Committee. ()
14. Total station was initially known as electronic tacheometer. ()
15. Total station is used to measure only horizontal and vertical angles. ()

Section III-Fill in the blanks with missing word or words. Each correct answer carries 1 mark. **(10 marks)**

1. The Cadastral Surveyors Licensing Board consists of..... members, and there should be at least..... to meet quorum for the board meeting.
2. Realignment between registered lands shall be approved by..... while cases involving state land shall be approved by.....
3. The realignment cases for public interest shall be initiated by
4. Distance measurement must be better than.....
5. shall submit the list of surveyors to be audited to the for final endorsement.
6. GPS satellites are at the distance of.....km above the earth surface, and orbit once every.....hours.

Question IV: Short answer question. Write answer in answer sheet. Don't forget to write section no. Each question carries 1 mark. **(5 marks)**

1. State a unique map attribute that connects plot with the thram.
2. Why instrument calibration is important?
3. What distances must be maintained from registered boundary while laying structures on surface and underground?
4. Mention 2 measurement units of distance acceptable for cadastral survey.
5. Outline importance of National Grid Coordinate System in cadastre.

Part B

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

Section V.

1. State the parameters of National Grid Coordinate system? **(2 marks)**
2. Calculate orthometric height if geoidal height and ellipsoidal height at a point is -43.38 and 1536.17 meters respectively. **(2 marks)**
3. State two properties of Transverse Mercator Projection? Justify, why it is not suitable to use for a world map? **(2 marks)**
4. Ellipsoidal distance between two points is 100 meters, and ellipsoidal and scale factors are 2 and 3 respectively. What will be distance on map and ground. **(4 marks)**

Section VI. *Each question carries 2 marks.*

1. State 2 sources of errors for total station surveying. How will you mitigate them?
2. Write 2 advantages and disadvantages of Total Station.
3. Explain three segments of GPS.
4. Mention 2 sources of error and their mitigations for GPS.
5. What things will you consider in selecting different instruments for cadastral surveying?

Section VII.

1. State four functions of the Cadastral Surveyors Licensing board. **(2 marks)**
2. Mention requirements to apply for registration. **(2 marks)**
3. When, and how to process renewal of license? **(2 marks)**
4. Describe procedure to register as a licensed surveyor. **(4 Marks)**

Section VIII.

1. Why datum transformation is important? State impacts on cadastral map. **(3 marks.)**
2. What are advantages of using Druk CORSNET? **(2 marks)**
3. State achievements of NCRP. **(2 marks)**
4. Explain evolution of cadastral surveying in Bhutan? **(3 marks)**

Section IX. *Each question carries 2 marks.*

1. How would you realign common boundary of registered plots?
2. Explain procedure to remove survey monument from private plot.
3. What requirements must be checked while using GNSS-RTK in cadastre?
4. How will you ensure quality of measurements with GNSS-RTK?
5. State 4 obligations of land owners during the cadastral survey.

Section X.

1. *Systematic shift is detected in a cadastral map consisting of 1000 plots. On preliminary investigation, it was found that issue arose as a result of surveying with wrongly computed coordinates.* Explain efficient course of actions you will take to correct the cadastral map. **(5 marks).**
2. *Cadastral surveying is not conducted in a fur-flung village. Village is partially located in deep valley, and control points are not established.* Describe how you will plan and survey the mentioned village? **(5 marks)**