

073105T4LAS
LAND SURVEY AND MAPPING LEVEL 5
LSM/OS/LM/CC/02/5/A
Operate Survey Instruments
Nov/Dec 2024



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

WRIT ENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. Marks for each question are indicated in the brackets.
2. The paper consists of **TWO** sections: **A** and **B**.
3. Candidates are provided with a separate answer booklet
4. **DO NOT** write on this question paper.

This paper consists of FIVE (5) printed pages
Candidates should check the question paper to ascertain that all
pages are printed as indicated and that no questions are missing.

SECTION A: (40 MARKS)**Answer ALL the questions from this section**

1. The principle of levelling is to obtain the difference of levels of two points with the instrument known as level. List FOUR types of levelling instruments used in surveying
(4 marks)
2. The fundamental lines are imaginary lines in a theodolite instrument. The relationship among fundamental lines is very important in determining instrument errors in a theodolite. List any THREE fundamental lines in a theodolite.
(3 marks)
3. Unit conversion is a fundamental aspect in surveying. Convert the following Whole Circle Bearings into quadrant bearings
 - a) $240^{\circ} 10' 00''$ (2 marks)
 - b) $352^{\circ} 10' 00''$ (2 marks)
 - c) $131^{\circ} 00' 00''$ (2 marks)
4. The principle of compass surveying is traversing, which involves a series of connected lines. Outline THREE main differences between a Prismatic compass and a Surveyor's compass
(6 marks)
5. Linear / distance measurement is a v exercise in land survey. List FIVE instruments used in linear measure
(5 marks)
6. Modern technology has incorporated both linear and angular measuring instruments. Hence both distances and angles are measured in real time. Highlight TWO such linear-angle measuring instruments.
(2 marks)
7. Inaccuracies in GPS signals come from the variety of sources like satellite clocks, imperfect orbits and especially from the signal's trip through the earth's atmosphere. List THREE errors that are associated with GNSS equipment.
(3 marks)
8. A chain is used to measure distance on the field. Outline FOUR types of chains used in surveying.
(4 marks)
9. Unit conversion is a fundamental aspect in surveying. Convert the following into meters.
 - a) 18.985 Km (1 mark)
 - b) 25 ft (1 mark)
10. Proper care and maintenance of survey instruments is paramount to ensure they are accurate and durable. State any THREE maintenances and cares for surveying instruments.
(3 marks)

11. The aim of levelling is to determine the relative heights of different objects on or below the surface of the earth. List two instruments used in levelling. (2 marks)

SECTION B: (60 MARKS)**Answer Any THREE questions in this section**

12. A theodolite is an instrument used to measure both horizontal and vertical angles.

a) Draw and label the parts of a theodolite. (10 marks)

b) State and explain any FIVE essential parts of the theodolite in (a) above. (10 marks)

13.

a) The main purpose of levelling is the determination of heights of points on the earth's surface. List and expound on FIVE sources of error in levelling. (10 marks)

b) The following consecutive readings were taken with a dumpy level along a chain line at a common interval of 15m. The first reading was at a chainage of 165 where the RL is 98.085. The instrument was shifted after the fourth and ninth readings 3.150, 2.245, 1.125, 0.860, 3.125, 2.760, 1.835, 1.470, 1.965, 1.225, 2.390 and 3.035 m. Mark rules on your answer booklet in the form of a level book page and enter on it the above readings and find the RL of all the points by the height of collimation method. Also perform tie checks. (10 marks)

14.

a) The principle of tacheometry is based on the property of isosceles triangles, where the ratio of the distance of the apex and the length of the base is always constant. Define tacheometric surveying. (2 marks)

b) The chaining operation is completely eliminated in tacheometric survey. List the instruments used in tacheometric survey (2 marks)

c) Identify TWO Global Navigation Satellite System (GNSS) receivers. (2 Marks)

d) A tachometer was set up at station C and the following readings were obtained on a staff vertically held.

Inst. Station	Staff Station	Vertical angle	Hair readings (m)	Remark
C	BM	- 5° 20'	1.50, 1.800, 2.450	RL of BM = 750.50 m
C	D	+ 8° 12'	0.750, 1.500, 2.250	

Calculate the horizontal distance CD and RL of D, when the constants of instrument are 100 and 0.15. (14 marks)

15.

- a) Measuring tapes are available in lengths of 20, 30 and 50 m. Give the FOUR various types of tapes (4 marks)
- b) Theodolite may be classified into transit and non-transit theodolites. List any two uses of a Theodolite (2 marks)
- c) In linear measurements there are various tape corrections needed to be applied depending on the field conditions under which the measurements are carried out and the precision in measurements. Outline any SEVEN types of tape corrections in linear measurements giving their respective formulas. Explain any symbols used. (14 marks)