



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATION FOR THE DEGREE IN SCIENCE IN
CONSTRUCTION MANAGEMENT**

2ND YEAR 1ST SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TEB 1208

COURSE TITLE: ENGINEERING SURVEYING I

EXAM VENUE: STREAM: BSc. REN ENGY TEC & MGT

DATE: /12/2023 EXAM SESSION:

DURATION: 2 HOURS

Instructions

- 1. Answer ALL questions in Sections A and B and ANY other TWO questions in Section C**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A 10 Marks (Compulsory)

QUESTION ONE 10 Marks

a) Answer the following

- i. Define what you understand by engineering surveying. (1 Mark)
- ii. What do you understand by the term elevation in survey (1 Mark)
- iii. What is an odometer (1 Mark)
- iv. Name the equipment given below (1 Mark)



v. Name the instrument given here below (1 Mark)

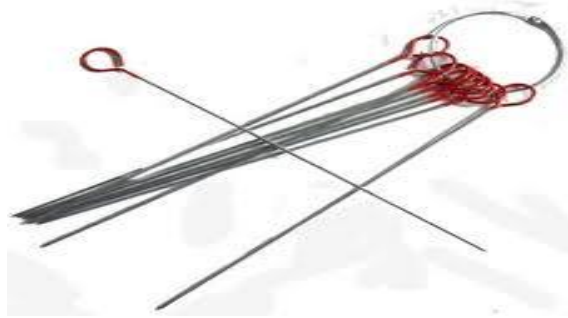


b) Answer all the questions given here below

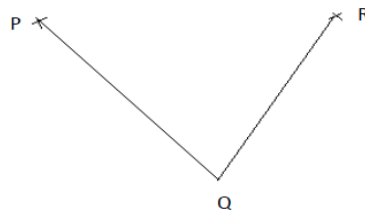
- i. Define Geodetic survey (1 Mark)
- ii. State what the survey instrument given below is used for (1 Mark)



- iii. In British system of surveying, a set of the instruments given below contains how many pieces (1 Mark)



- iv. Define the term precision as used in surveying (1 Mark)
- v. The figure below shows field arrangement of some three survey stations when using theodolite to measure horizontal angles. The central station Q is then called what? (1 Mark)



SECTION B 20 Marks (Compulsory)

This section has only one question which is compulsory

QUESTION TWO (20 Marks)

- a) Any field survey exercise is intended to solve a particular engineering problem. List any six objectives which may make you carry out a survey work. (3 Marks)
- b) We can classify survey activities based on some criterion. One criteria is the **purpose** of survey. Under this classification, one of the classes is **construction survey**. Explain the purpose of construction survey. (3 Marks)
- c) Survey exercise basically involves taking measurements in the field and then moving to the office to process and present the collected data.
- i. Briefly explain any four basic measurements which a surveyor may do in the field 4 marks (4 Marks)
- ii. In carrying linear measurement down of a hill using chain/tape method, the surveyor requires some five basic survey instruments to support accurate work. Outline these five basic instruments (2.5 Marks)
- d) Any measurement done in survey normally has some form of error (s) inherent in it. One can never measure a quantity in survey which is 100% accurate. Briefly discuss the three basic sources of errors in surveying work (6 Marks)
- e) Explain briefly the principle of barometric levelling in engineering surveying (2.5 Marks)

SECTION C (40 Marks)

This section has four questions. All the questions carry the same marks. You are required to attempt any two questions only

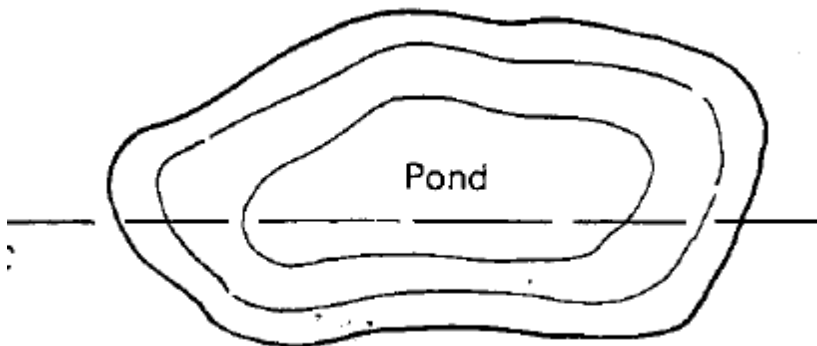
QUESTION TWO (20 Marks)

Intersection, angle and distance, offset (normal, oblique, radial) and ties are methods commonly used to fix points on the ground in the process of undertaking engineering survey. With the aid of neat clear sketches, briefly explain how the following techniques are used in fixing points

- a) Intersection by distances (4 Marks)
- b) Intersection by angles (4 Marks)
- c) Angle and distance (4 Marks)
- d) Perpendicular offsets (4 Marks)
- e) Oblique Offset / Ties (4 Marks)

QUESTION THREE (20 Marks)

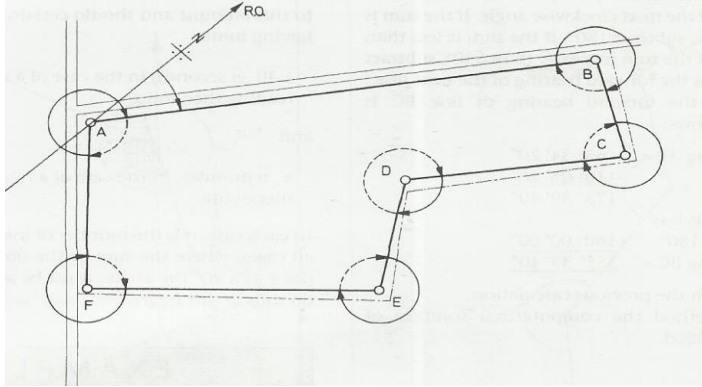
- a) Describe any four methods of approximating linear horizontal distance measurement (8 Marks)
- b) In the process of chaining exercise, a survey line comes across a pond as shown. Describe a simple technique that bypasses the pond to continue with the chaining exercise. Include illustrative diagram. (6 Marks)



- c) A fourth year renewable energy student in JOOUST is undertaking a project in wind power. She intends to install a windmill at the top of the overhead water tank at gate A. She wants to determine the elevation of the top of the tank. Describe a suitable levelling method which she can apply. Include an illustrative sketch (6 Marks)

QUESTION FOUR (20 Marks)

- a) Answer the following
 - i. What do you understand by the term traversing in survey (1 Mark)
 - ii. Name two types of traversing which you know based on traverse route (2 Marks)
 - iii. List the survey instruments which you may need for a traverse survey (3 Marks)
 - iv. Outline the procedure of observing horizontal angles using a theodolite (4 Marks)
- b) The figure below shows a route of a traverse survey. The values of exterior angles measured by one second theodolite are given in the table below.



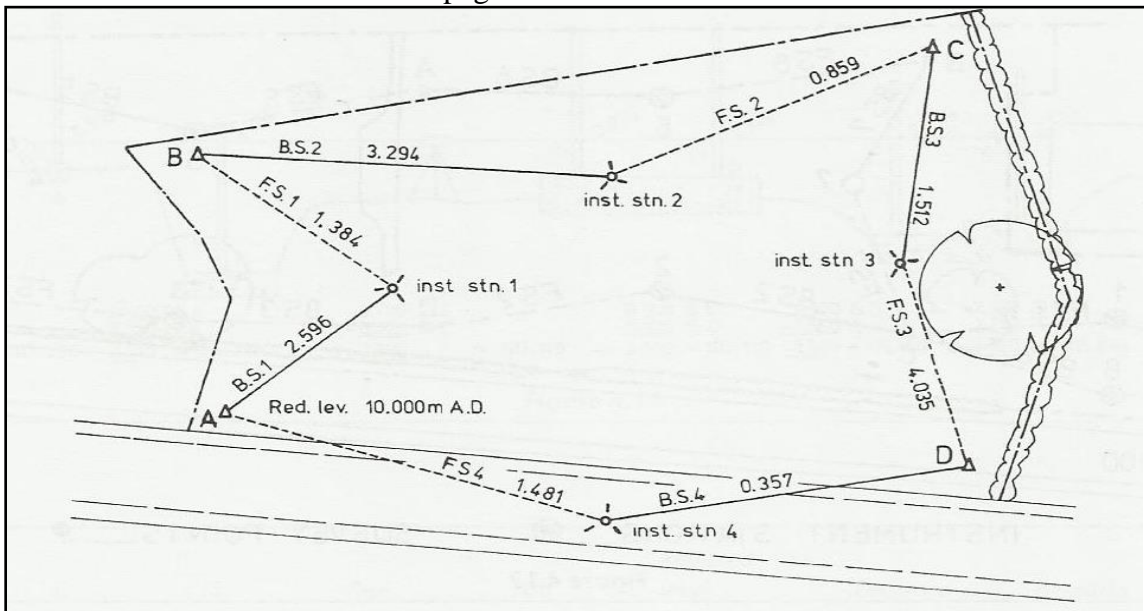
The whole circle bearing of line AB is $43^{\circ} 40' 45''$

Angle	ABC	BCD	CDE	DEF	EFA	FAB
Mean observed value	$272^{\circ} 03' 10''$	$272^{\circ} 05' 51''$	$104^{\circ} 50' 31''$	$261^{\circ} 11' 06''$	$266^{\circ} 10' 15''$	$263^{\circ} 38' 25''$

- Determine the angular error of the traverse (2 Marks)
- Adjust the angles of the traverse to eliminate the error (4 Marks)
- Calculate the bearing of all other lines of the traverse (4 Marks)

QUESTION FIVE (20 Marks)

- Aided with neat sketches, briefly explain the principle of using a level instrument in measuring vertical heights (8 Marks)
- The figure below shows a proposed construction site with four survey stations (A to D) marked with pegs. The pegs are to be used as Temporary Bench Marks (TBM) for the duration of the construction works. The elevation of peg A has already been established as 10,000m above sea level. Flying levelling was made around the site in order to establish the reduced levels of the pegs.

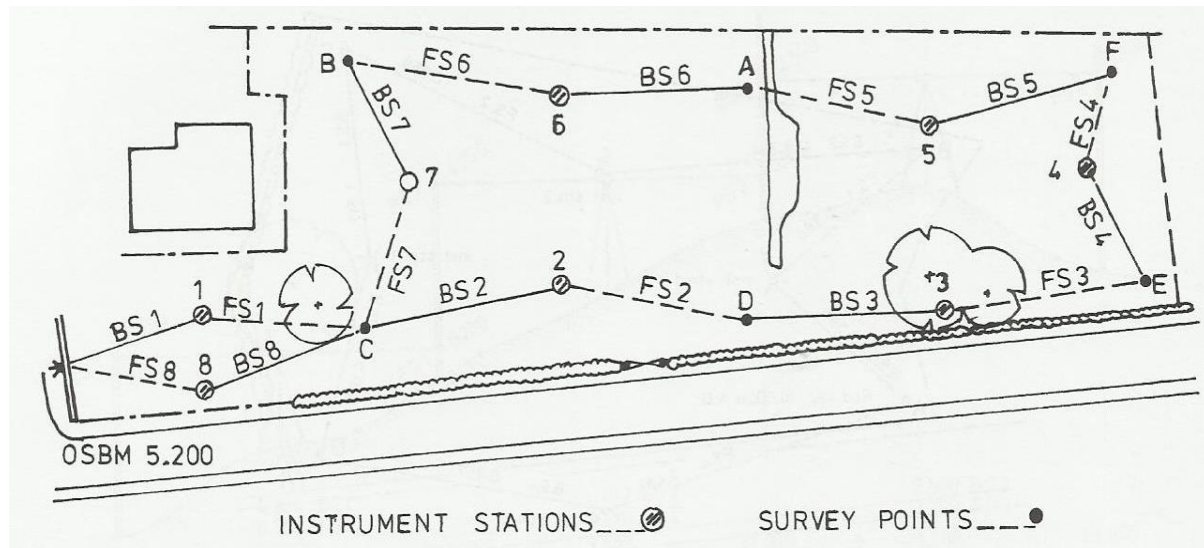


- i. Book the readings using height of collimation method and calculate the reduced levels (9 Marks)
- ii. Carry out a check for arithmetic computations (1.5 Marks)
- iii. Check also the accuracy work (1.5 Marks)

QUESTION SIX (20 Marks)

Given below is a site where a survey activity was carried out for establishment of a horticultural project field office. Profile survey started from a bench mark OSBM, went round the given stations and was closed on the same bench mark.

- a) Book the readings and compute the levels of the survey stations marked A to F using Rise and Fall method (16 Marks)
- b) Check computation error (2 Marks)
- c) Check also accuracy where possible (2 Marks)



The table below gives the values of the readings in the chart above

BS1=1.955	BS2=1.315	BS3=1.243	BS4=2.071	BS5=1.570	BS6=1.835	BS7=0.631	BS8=1.200
FS1=2.030	FS2=0.885	FS3=1.485	FS4=0.880	FS5=1.590	FS6=0.540	FS7=3.289	FS8=1.130

The RL of OSBM = 5.200m asl