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**SURVEYING I AND WORKSHOP  
TECHNOLOGY I (MECHANICAL)**

**June/July 2020**

**Time: 3 hours**



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**

**DIPLOMA IN BUILDING CONSTRUCTION  
DIPLOMA IN CIVIL ENGINEERING  
DIPLOMA IN ARCHITECTURE**

**MODULE I**

**SURVEYING I AND WORKSHOP TECHNOLOGY I (MECHANICAL)**

**3 hours**

**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*Answer booklet;*

*Drawing instruments;*

*Scientific calculator.*

*This paper consists of **EIGHT** questions in **TWO** sections; **A** and **B**.*

*Answer **FIVE** questions choosing at least **TWO** questions from section **A** and **B** and **ONE** other question from either section.*

*Maximum marks for each part of a question are indicated.*

*Candidates should answer the questions in English.*

**This paper consists of 6 printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

## SECTION A: SURVEYING I

*Answer at least TWO questions from this section.*

1. (a) Define each of the following terms as used in levelling:

- (i) back sight;
- (ii) vertical line;
- (iii) reduced level;
- (iv) temporary benchmark.

(6 marks)

(b) **Figure 1** shows staff readings taken from point K along a proposed sewer line through points R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>6</sub>, R<sub>7</sub>, L.

- (i) book the readings in a standard format;
- (ii) reduce levels by rise and fall method and apply arithmetic checks.

(14 marks)

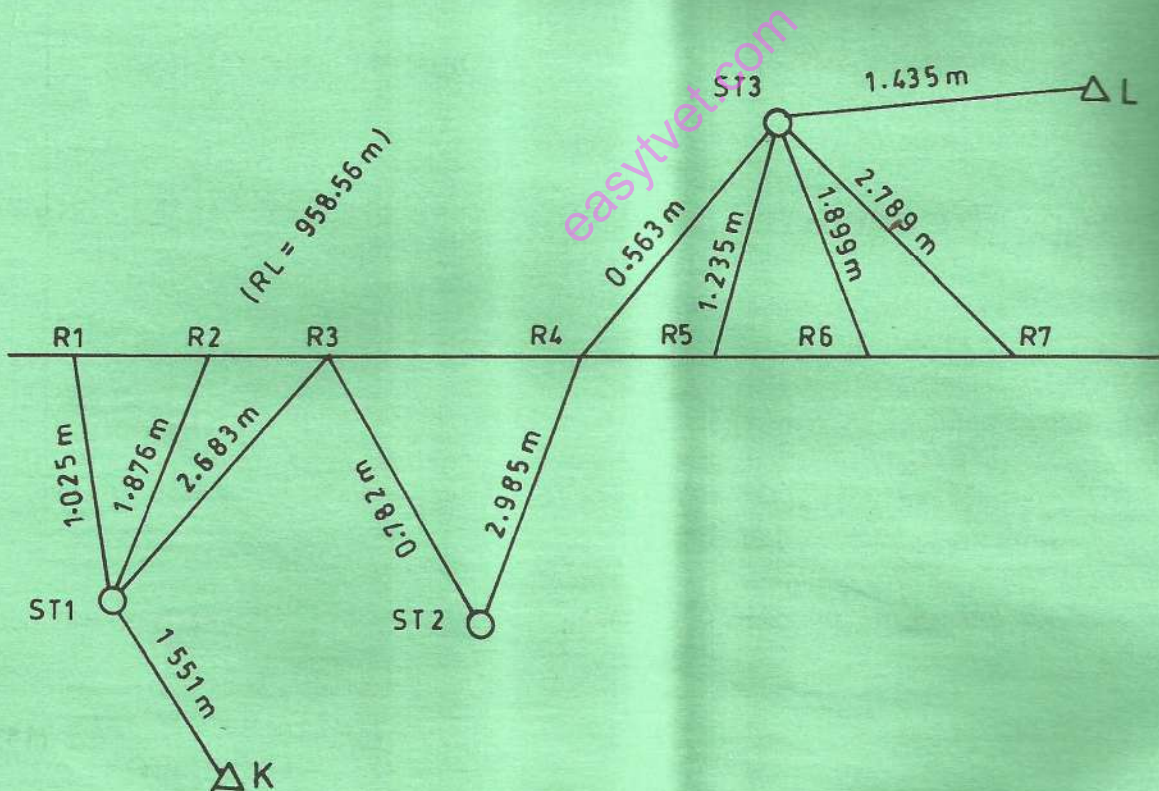


Fig.1

2. (a) Explain each of the following types of survey:
- (i) cadastral survey;
  - (ii) engineering survey;
  - (iii) topographical survey;
  - (iv) aerial survey.
- (8 marks)
- (b) Outline the procedure of chain surveying. (6 marks)
- (c) Explain the **three** temporary adjustment of a dumpy level. (6 marks)
3. (a) **Table 1** shows staff readings in a levelling exercise.

**Table 1**

Backsight	Intermediate Sight	Foresight	Remarks
1.218			BM(RL = 205.471 m)
	1.677		
	2.486		
	3.534		
	3.981		
	4.532		
2.415		4.682	
	1.922		
	1.635		
	1.457		
		0.988	

Determine the reduced levels by height of collimation method and apply arithmetic checks.

(15 marks)

3.632  
5.67

-0.459  
-0.809  
-1.495  
-0.551  
-0.15  
0.493  
0.287  
0.178  
0.469

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Turn over

-2.03

-2.037

(b) State the use of each of the following equipment:

- (i) ranging rod;
- (ii) optical square;
- (iii) steel tape;
- (iv) abney level;
- (v) levelling staff.

(5 marks)

4. (a) Differentiate between each of the following terms used in levelling:

- (i) benchmark and datum surface;
- (ii) level line and horizontal line.

(6 marks)

(b) Table 2 shows an extract from a levelling field book.

- (i) Rule out a page of the field book and enter the reading;
- (ii) Reduce the levels of the staff stations by rise and fall method and apply arithmetic checks.

(14 marks)

Table 2

Backsight	Intermediate Sight	Foresight	Remarks
1.375			
	0.567		
	0.970		
-1.213		-1.757	
1.860		1.250	BM (RL = 1045.02 m)
		2.005	

Handwritten calculations and notes:

- $4.448 - 5012$
- $4.564$
- $1.2098$
- $2.022 -$
- $7.238 -$
- $-3.703$
- $2.022$
- $1.315 -$
- $2.592$
- $1.985 - 1297$
- $-4.511$

**SECTION B: WORKSHOP TECHNOLOGY (MECHANICAL)**

*Answer at least TWO questions from this section.*

5. (a) Highlight **five** obligations of each of the following in relation to health and safety act.
- (i) company owners;
  - (ii) employees.
- (10 marks)
- (b) Explain how each of the following fire extinguishers work:
- (i) carbon dioxide;
  - (ii) water and foam;
  - (iii) cartridge operated dry chemicals.
- (6 marks)
- (c) State **four** precautions observed when lifting heavy objects in workshop manually.
- (4 marks)
6. (a) Explain each of the following terms used in pumps:
- (i) strainer;
  - (ii) static suction lift;
  - (iii) volumetric flow.
- (6 marks)
- (b) Sketch and label each of the following types of pumps:
- (i) centrifugal;
  - (ii) reciprocating.
- (11 marks)
- (c) State **three** factors considered in selection of pumps.
- (3 marks)

7. (a) Sketch each of the following hand tools stating the function for each in mechanical workshop:
- (i) open ended spanner;
  - (ii) floor board chisel;
  - (iii) bent bolt.
- (9 marks)
- (b) Explain **three** functions of diesel injection system. (6 marks)
- (c) State **five** maintenance practices for hand tools. (5 marks)
8. (a) Sketch and label a section through a petrol engine. (6 marks)
- (b) Outline **four** precautions observed when operating a lathe machine. (6 marks)
- (c) Explain each of the following tasks performed by a lathe machine:
- (i) facing;
  - (ii) boring;
  - (iii) reaming;
  - (iv) knurling.
- (8 marks)

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