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

Oct./Nov. 2022

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN BUILDING TECHNOLOGY
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;

Scientific calculator;

Drawing instruments.

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

Answer FIVE questions choosing TWO questions from section A, TWO questions from section B and ONE question from either section.

All questions carry equal marks.

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

Candidates should answer the questions in English.

This paper consists of 4 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) datum surface;
- (ii) horizontal surface;
- (iii) line of collimation;
- (iv) bench mark.

(6 marks)

(b) Table 1 shows reducing of levels with some entries missing. Copy the table and fill in the missing values. (apply arithmetic checks).

Table 1

BS	IS	FS	RISE	FALL	REDUCED (m)	Remarks
-----	2.98		0.405		-----	BM 1
	-----		0.667		-----	Peg 1
1.988		-----		0.294	-----	Peg 3
	-----			0.514	231.781	Peg 4
	-----		-----		-----	Peg 5
-----		1.316	1.099		-----	Peg 6
		1.532	1.888		234.855	BM 2

(14 marks)

2. Table 2 shows reduced ground levels of the centre line of a proposal road. Using horizontal scale of 1:20000 and vertical scale of 1:100 plot the profile. (20 marks)

Table 1

Chainage	0	50	100	150	200
Original ground levels	1221.237	1222.65	1221.206	1222.87	1218.20
Formation levels	1221.10	1222.00	1220.9	1220.8	1220.7

3. Table 3 shows readings taken during a levelling exercise.

- (i) Reduce the readings using the height of collimation method applying usual arithmetic checks.
- (ii) Calculate the gradient between chainage 100 and 300.

(20 marks)

Table 3

B.S	I.S	FS	CHAINAGE (m)	Remarks
2.450			0	P1
	1.245		50	P2
	2.220		100	P3
	0.150		150	P4
0.415		1.250		CP
	1.250		200	P5
	2.310			(RL-2530.65 M) P6
1.415		0.105		CP
2.100		1.215		CP
	0.410		300	P7
		0.425	330	P8

4. (a) Explain each of the following types of surveys:
- Topographical surveying;
 - Cadastral surveying;
 - Engineering surveying;
 - Aerial surveying.
- (6 marks)
- (b) Distinguish between plane surveying and geodetic surveying. (4 marks)
- (c) Outline six characteristics of contour lines. (6 marks)
- (d) During a direct contouring exercise, a level was used to read on a staff held on a bench mark of 150.56 m above mean sea level. The staff reading at the bench mark was 2.345 m. If the contour being determined was 149.50 m. Find the staff reading used to locate the contour. (4 marks)

SECTION B: WORKSHOP TECHNOLOGY I (MECHANICAL)

Answer at least TWO questions from this section.

5. (a) Explain **four** factors considered in selection of a water pump. (8 marks)
- (b) With the aid of labelled sketches, explain the operation of each of the following water pumps:
- (i) centrifugal
 - (ii) submersible. (12 marks)
6. (a) Explain **three** classifications of mechanical hand tools. (6 marks)
- (b) State **three** advantages of each of the following methods of caring for tools.
- (i) repairing;
 - (ii) lubricating. (6 marks)
- (c) Sketch and label each of the following mechanical hand tools.
- (i) pry bars;
 - (ii) ball-peen hammer. (8 marks)
7. (a) Outline the procedure for carrying out facing using a lathe machine. (6 marks)
- (b) Explain **four** safety precautions when using machines. (8 marks)
- (c) Explain the operation of the following:
- (i) injection pump;
 - (ii) fuel pump;
 - (iii) ignition system (6 marks)
8. (a) Explain **four** elements that pollute a working environment. (8 marks)
- (b) (i) Define the term 'safety hazard'.
(ii) State **two** examples of safety hazards in a mechanical workshop. (3 marks)
- (c) With the aid of a labelled sketch, explain the operation of a four stroke engine. (9 marks)

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