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2705/104 2709/104
2707/104 2710/104
SURVEYING I AND WORKSHOP TECHNOLOGY I (MECHANICAL)
June/July 2019
Time: 3 hours

30 AUG 2019
17

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN BUILDING CONSTRUCTION
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;
Mathematical tables/ non-programmable 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.
Marks for each part of a question are as indicated.
Candidates should answer the questions in English.

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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.

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SECTION A: SURVEYING I

*Answer at least **TWO** questions from this section.*

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

(i) horizontal line;
(ii) line of collimation;
(iii) datum surface.

(6 marks)

(b) **Table 1** shows readings obtained during a leveling exercise for a proposed road.

Table 1

BS	IS	FS	Distance (m)	Remarks
3.140			0	A
	2.024		30	
3.403		1.820	60	
	2.704		90	BM(RL = 1500.123 m)
	3.061		120	
		3.325	150	B

(i) Using a field level book format, reduce the levels by height of collimation method (apply necessary arithmetic checked).

(ii) Determine the gradient from A to B.

(14 marks)

2. (a) Explain **four** types of survey. (8 marks)

(b) Staff readings for a leveling exercise are as shown in **table 2**.

Table 2

Point	K	L	M	N	P
Staff reading (m)	2.127	- 3.808	3.675 4.125	1.407	4.563

Using a field level book format reduce the levels for the points by rise and fall method, given the reduced level of point P is 2000 m above mean sea level (apply arithmetic checks). (12 marks)

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3. (a) State:

(i) **six** characteristics of contours;
(ii) **three** uses of contour maps.

(9 marks)

(b) Fly leveling was done to install a temporary benchmark on a site from a bench mark of reduced level 1000 m and the readings were recorded as in **table 3**.

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Table 3

Back sight	2.425, 3.145, 3.180
Fore sight	2.250, 4.550, 3.355

Determine the reduced levels of the TMB by height of collimation method (apply checks). (11 marks)

4. (a) Differentiate between the following terms as used in surveying:

(i) plane surveying and geodetic surveying;
(ii) instrument station and staff station;
(iii) back sight and foresight.

(9 marks)

(b) Sketch and label a titling level. (5 marks)

(c) Explain **three** temporary adjustments performed on a dumpy level before making observations. (6 marks)

SECTION B: WORKSHOP TECHNOLOGY I (MECHANICAL)

*Answer at least **TWO** questions from this section.*

5. (a) State **five** safety precautions relating to power hand tools. (5 marks)

(b) Highlight **four** precautions considered when lifting heavy objects in a workshop. (4 marks)

(c) Explain each of the following terms related to pumps:

(i) static discharge head;
(ii) self-priming;
(iii) volumetric flow.

(6 marks)

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(d) Calculate the energy required in kilowatt to operate a pump using:

Unit weight of water	9.8 kN/m^3
Total pumping head including friction	5 m
Efficiency	80%
Discharge	20 m^3/s

(5 marks)

6. (a) With the aid of a labeled sketch explain the operation of a four cycle engine. (14 marks)

(b) Outline **two** tools for each of the following tasks:

(i) measuring;
(ii) holding;
(iii) testing.

(6 marks)

7. (a) Explain the operation of each of the following fire extinguishers:

(i) wet chemical extinguishers;
(ii) CO_2 extinguishers;
(iii) dry powder extinguishers;
(iv) foam extinguishers.

(8 marks)

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(b) Sketch and label each of the following tools:

(i) adjustable spanner;
(ii) side cutting plier;
(iii) hand vice.

(12 marks)

8. (a) With the aid of labeled sketch, describe a horizontal milling machine. (8 marks)

(b) Explain the function of each of the following parts of a lathe machine:

(i) head stock;
(ii) lead screw;
(iii) carriage;
(iv) spindle.

(8 marks)

(c) Differentiate the operation of diesel engine from petrol engine. (4 marks)

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