

GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination

JUNE 2025

INTERMEDIATE LEVEL

Specialty Name and Acronym	CIVIL ENGINEERING BUILDING CONSTRUCTION – CE-BC
Subject Title	Survey, Soil Mechanics and Materials
Subject Code No.	5230
Paper No.	2

Duration: Three Hours

INSTRUCTIONS TO CANDIDATES

This Paper Comprises THREE (3) Sections: A, B and C

Candidates are required to Answer Four (4) Questions.

Choose Two (2) Questions in Section A and One each in Sections B and C

All Questions carry equal marks

Precise Answers should be given and where necessary support them with neat sketches

All Answers should be corrected to two decimal places.

Take $\pi=3.14$, density of water $=1000\text{kg/m}^3$, $g=10\text{m/s}^2$, level constant "C" $=100$.

You are allowed to use mathematic set and non-programmable calculator.

You are reminded of the necessity for good English and orderly presentation in your answers.

Turn Over

SECTION A:
MATERIALS (Answer any TWO Questions)

QUESTION ONE

- a) Define binders and enumerate three kinds of binders
- b) What are the principal raw materials used in the manufacturing of Portland cement
- c) Differentiate between quick lime and slaked lime
- d) State three uses of lime in a civil engineering industry
- e) Differentiate between initial and final setting time of a cement paste

(25 marks)
(5 marks)
(3 marks)
(4 marks)
(6 marks)
(7 marks)

QUESTION TWO

(25 marks)

The Regional Council of your area in order to curb rural exodus has decided to come up with plans to industrialise the Region. One of these plans is the creation of a factory for the production of various building materials. As a future technician and an aspiring structural Engineer, your services were solicited to give advice on the following;

- a) What do understand by the term false set of a cement paste?
- b) List and define four properties of ordinary Portland cement.
- c) State three criteria used in the selection of steel for a given project
- d) Explain two methods used to protect steel against corrosion
- e) What are ferrous metals? List two non ferrous metals

(2 marks)
(8 marks)
(6 marks)
(4 marks)
(5 marks)

QUESTION THREE

(25 marks)

- a) List and define two properties of bituminous binders
- b) List one similarity and one different between tar and bitumen
- c) Define fresh concrete and give four of its properties
- d) State the test, apparatus, procedure and aim for the determination of the setting time of Portland cement.

(6 marks)
(4 marks)
(6 marks)
(9 marks)

SECTION B:
SOIL MECHANICS (Answer any one question)

QUESTION FOUR

(25 marks)

- a) What is the different between a soil profile and a soil horizon
- b) State and give the property of soil which is of alto most importance to the civil engineer and a farmer
- c) Define compaction and state one method of compaction
- d) Figure 1 represents a sample of a test obtained after a slump test. You are required to analysis the results by stating the name and the water quantity

(6 marks)
(7 marks)
(6 marks)
(6 marks)

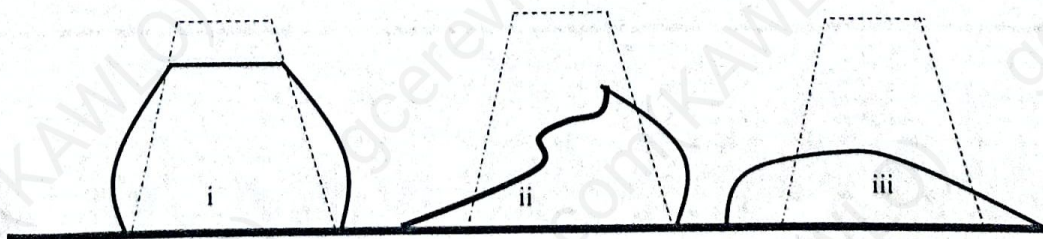


Figure 1

QUESTION FIVE**(25 marks)**

- a) Define igneous rocks and give two examples **(5 marks)**
 b) The drawing in the figure 2 is a clay brick. You are required to label it and give its dimensions **(7 marks)**

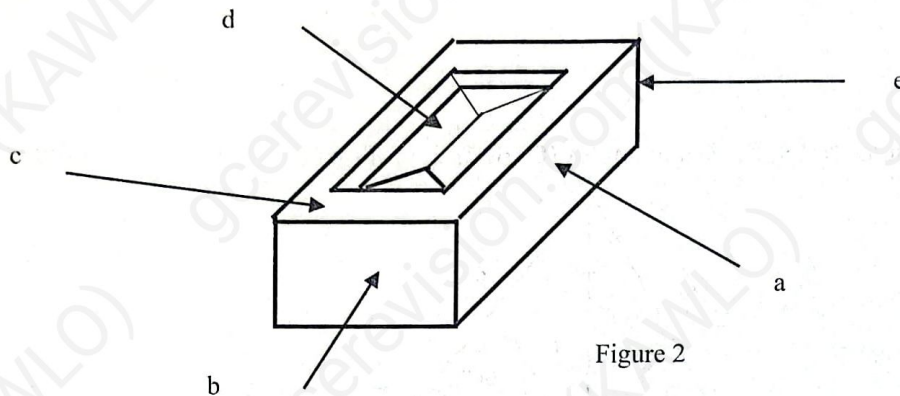


Figure 2

- a) State five properties of good aggregates **(5 marks)**
 b) What is firing of clay bricks **(2 marks)**
 c) State and elaborate the test procedure used in the laboratory to determine the consistency of cement **(8 marks)**

SECTION C:**SURVEYS (Answer any one question)****QUESTION SIX****(25 marks)**

- a) Define chain surveying and give the basic equipment used for this type of surveying **(6 marks)**
 b) What is trigonometric levelling? Give the basic equipment for this type of levelling **(5 marks)**
 c) Convert the following angles from degree, minutes and seconds to radians:

- (i) $35^{\circ} 55' 45''$
 (ii) $29^{\circ} 03' 46''$
 (iii) $130^{\circ} 27' 59''$
 (iv) $180^{\circ} 0' 0''$

(4 marks)

- d) You are carrying out chain survey on an aligned track A and B, and come across an obstacle see figure 3. Explain a method you will use to overcome this obstacle in figure 3. **(10 marks)**

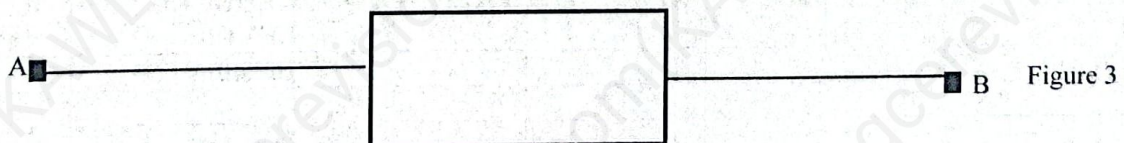


Figure 3

Turn Over

QUESTION SEVEN**(25 marks)**

a) A distance of 130.30 m was measured on a land. Calculate the lengths to be drawn on paper with the following scales:

- i) 1:500
- ii) 1:250
- iii) 1:200
- iv) 1:5000

(4 marks)

b) Calculate the missing sides (H, S, D, E) and angles (Θ , β) of the following triangles seen in figure 5

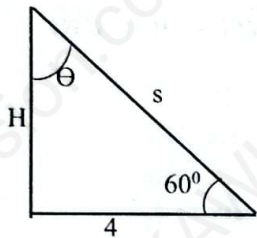
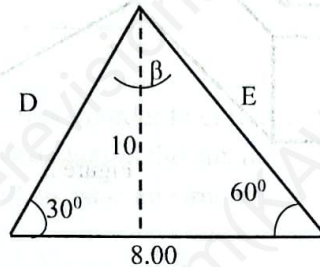
(6 marks)

Figure 5



c) List four errors found in chain survey

(4 marks)

d) Calculate the reduced levels of the survey carried out as seen in the diagram in figure 6

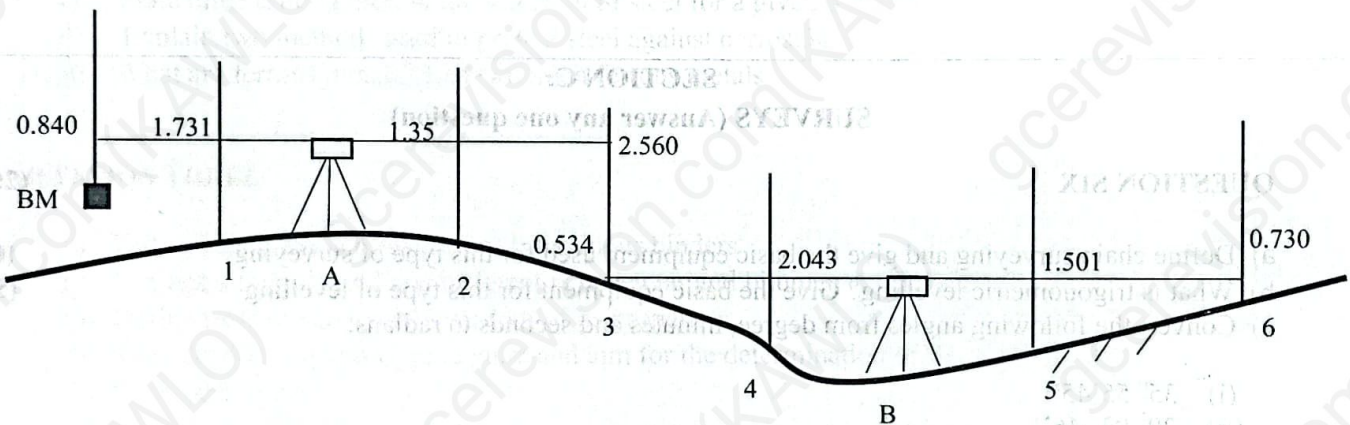
(11 marks)

Figure 6

Points sighted	BS	IS	FS	RISE	FALL	REDUCED LEVEL	Observation
BM	0.840					204.40m	BM