



# KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER  
SPECIAL/SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF  
B.SC RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: REN 216

COURSE TITLE: ENGINEERING SURVEYING

DURATION: 2 HOURS

DATE: 15/02/2021 2019 TIME: 2:00 - 4:00 PM

---

### INSTRUCTIONS TO CANDIDATES

- (i) Answer Question 1 (Compulsory) and any other TWO questions
- (ii) All symbols have their usual meaning

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

**QUESTION ONE (Compulsory) – 30 MARKS**

- a) Define the following terms.
- (i) Datum **(1 Mark)**
  - (ii) Bench mark **(1 Mark)**
  - (iii) WCB **(1 Mark)**
  - (iv) Profile leveling **(1 Mark)**
- b) Differentiate between the following.
- (i) Backsight and Foresight **(2 Marks)**
  - (ii) Accuracy and Error of closure **(4 Marks)**
- c) Give the formulae and define the terms therein for the following steel tape corrections.
- (i) Sag **(3 Marks)**
  - (ii) Tension **(2 Marks)**
- d) Explain where the following are used.
- (i) Geodetic surveying **(3 Marks)**
  - (ii) Plane surveying **(2 Marks)**
- e) Differentiate between the following.
- (i) Blunders and Accidental errors **(4 Marks)**
  - (ii) Random errors and Systematic errors **(4 Marks)**
  - (iii) A Turning Point and an Azimuth. **(2 Marks)**

**QUESTION TWO – 20 MARKS**

A steel tape is 30m long between end graduations at a temperature of 20°C and under a pull of 44.5N when lying on the flat. Its cross-sectional area is 6.5mm<sup>2</sup>, its mass is 1.5kg, and its coefficient of linear expansion is 0.000011/°C. The tape is stretched over two supports between which it records 30.000m and is supported at two intermediate supports equally spaced, all supports being on the same level and the tape being allowed to sag freely between the supports. The temperature at observation is 25°C and the pull at the tape is 70N. The measurement is done at an altitude of 2000m above msl, E is 2×10<sup>11</sup> N/m<sup>2</sup>, and R is 6370km.

Calculate:

- a) The actual length between the end graduations **(16 Marks)**
- b) The equivalent length at mean sea level **(4 Marks)**

### QUESTION THREE – 20 MARKS

The groups of figures below refer to staff readings taken with a level from instrument stations: A, B, C, D, and E. The first and last readings in each group are backsight and foresight respectively. The backsight from station A was taken with the staff held on a bench mark at 204.110m A.O.D.

A: 2.680, 0.875, 0.980, 0.430; B: 1.665, 1.440, 0.625; C: 1.010, 1.690, 1.225;

D: 2.445, 3.575, 3.880, 2.880; E: 2.735, 2.005, 2.390

- Book the readings by the rise-and-fall method **(10 Marks)**
- Determine the reduced level of each staff station **(7 Marks)**
- Make all the checks you think necessary **(3 Marks)**

### QUESTION FOUR – 20 MARKS

A closed traverse ABCDEA has the following readings.

Line	Length (m)	Bearing
AB	189.53	S06° 15' W
BC	175.18	S29° 38' E
CD	197.78	N81° 18' W
DE	142.39	N12° 24' W
EA	234.58	N42° 29' E

- Compute and tabulate both the unadjusted latitudes and departures of all sides **(7 Marks)**
- Adjust the latitudes and departures in (a) above using the Bowditch method **(13 Marks)**

**QUESTION FIVE – 20 MARKS**

The following are latitudes and departures of the lines of a closed traverse ABCDA

Line	Latitude (m)	Departure (m)
AB	-116.1	-44.4
BC	+06.8	+58.2
CD	+80.5	+17.2
DA	+28.8	-31.0

Compute the area of the traverse using the Co-ordinate method

**(20 Marks)**