TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ARCHITECTURE & BUILT ENVIRONMENT

UNIVERSITY EXAMINATION FOR:

BACHELOR OF ARCHITECTURAL STUDIES/BACHELOR OF

ARCHITECTURE

EAR 4205: **SURVEYING**

END OF SEMESTER EXAMINATION

YEAR TWO SEMESTER I

SERIES: APRIL 2022

TIME: 2 HOURS

DATE: Pick Date April 2022

Instructions to Candidates
You should have the following for this examination
-*Answer Booklet, examination pass and student ID*
-*Scientific calculator*
-*Drawing instruments.*
This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other
TWO questions.
Do not write on the question paper.

QUESTION ONE (COMPULSORY) (30 MARKS).

a).   Citing relevant formulas and sketches, discuss the process of reciprocal levelling as applied in survey   **(14 Marks).**

b)   Discuss constant errors in levelling   **(8 Marks).**

c)   Explain ANY method of overcoming an obstruction during linear measurements in the field   **(4 Marks).**

d)   Discuss the following equipment used in chain surveying

    i).   Chain

    ii).   Ranging rod   **(4 Marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 MARKS)

a) The **figure 1,** shows a network of spot levels observed during the process of contouring of a site for the construction of a building. Given that the square grids were at intervals of 20 metres, draw contour lines for the site at the interval of 1.0 metre interval   **(14 Marks).**

Fig 1: Network of spot heights

b) In levelling across a river, reciprocal levelling observations gave the following results for the staff held vertically at points X and Y from level stations A and B on each bank respectively.

Staff reading of X from A = 2.753 m

Staff reading of X from B = 3.080 m

Staff reading of Y from A = 3.550 m

Staff reading of Y from B = 3.895 m

If the Reduced level of X is 100 m AOD, determine the level of Y   **(4 Marks).**

c) What is an offset   **(2 Marks).**

QUESTION THREE (20 MARKS)

a) The group of figures below refer to staff readings taken with a level from instrument stations, A, B, C, D and E. The first and the last readings in each group are the backsights and foresights respectively. The backsight from station A was taken with the staff held at a bench mark of 200 m above Ordinance Datum. The data is provided below:

A: 3.780, 0800, 1.200, 0.694: B: 1.775, 1.560, 0.543; C: 1.02, 1.700, 2.412, 1.225; D: 2.545, 3.451, 3.112, 2.413. Book the readings using Height of Collimation method and determine reduced level for each staff station   **(14 Marks).**

b) What factors would you consider first before deciding on the vertical interval to be used?   **(6 Marks).**

QUESTION FOUR (20 MARKS)

a)   State any five **significant corrections** that are applied to a steel band when obtaining linear measurements, using relevant equations. A 40 m bay of a baseline was measured using a 30 m steel band that had been standardized in a catenary at a tension of 100 N and a temperature of 20°C. The following data was recorded:

- Measured length = 30 m
- Applied tension = 70 N
- The radius of Earth's curvature = 6370 Km
- The differences in height between the two points = 0.7 m
- The altitude of the base = 2200 m above sea level
- Cross sectional area of the tape = 6.6 mm²
- Young Modulus of Elasticity (E) = $2.1*10^{11}$ N/mm²
- Coefficient of Linear Expansion (α) = $11*10^{-6}/^{0}C$
- Mass of the tape = 0.032 Kg/m
- Field temperature = 12°C

Determine the correct length of the bay reduced to mean sea level   (**20 Marks**).

QUESTION FIVE (20 Marks)

a)   Define the following terms as used in rise and fall systems

  i).   Backsight

  ii).   Foresight

  iii).   Intermediate sight

  iv).   Datum

  v).   Reduced level   (**10 Marks**).

b)   Using appropriate sketches and formula, discuss Curvature and Refraction corrections   (**10 Marks**).