(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 241

COURSE TITLE: ENGINEERING SURVEYING I

DATE: THURSDAY 11TH FEBRUARY 2021 TIME: 9.00 – 11.00 AM

INSTRUCTIONS:

1. This paper contains **FOUR** questions
2. Answer any **THREE** questions
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION 1 **(25 Marks)**

(a) Define engineering surveying. (2 marks)

(b) Explain the main purposes of engineering surveying by dividing the surveying process into three basic stages. (6 marks)

(c) With reference to survey measurements and observations, differentiate between the following:
Precision and Accuracy
Mistake and Error (4 Marks)

(d) What are random errors and how are they different from gross errors and systematic errors. (5 Marks)

(e) Two sides and the included angle of a triangle were measured with the following results: a = 155.25 m and $\sigma_a = \pm\ 0.03$ m, b = 71.25 m and $\sigma_b = \pm\ 0.02$ m, C = 40° 20' and $\sigma_c = \pm\ 20''$. Compute the area of the triangle and the standard error of the area. (7 marks)

QUESTION 2 **(25 Marks)**

(a) Describe with the aid of a diagram the method you would use when chaining a line that runs a cross a hill such that the visibility between the two end points are obscured. (7 marks)

(b) List SIX types of corrections that are normally applied to a distance measurement in catenary, quoting the equation used in each case. (6 Marks)

(a) A steel tape of nominal length 30 m was used to measure the distance between two points A and B on a structure. The following measurements were recorded with the tape suspended between A and B:

Line	Length measured	Slope angle	Mean Temperature	Tension applied
AB	29.872 m	3^0 40'	5^0	120 N

The standardized length of the tape against a reference tape is 30.014 m at 20^0 C and 50 N tension. The tape weighs 0.17 NM^{-1} and has a cross-sectional area of 2 mm^2, coefficient of linear expansion of 0.0000112 per °c and Young's modulus of elasticity as 2 x 10^5 N/mm^2 Calculate the horizontal length of AB.

(12 marks)

QUESTION 3 **(25 Marks)**

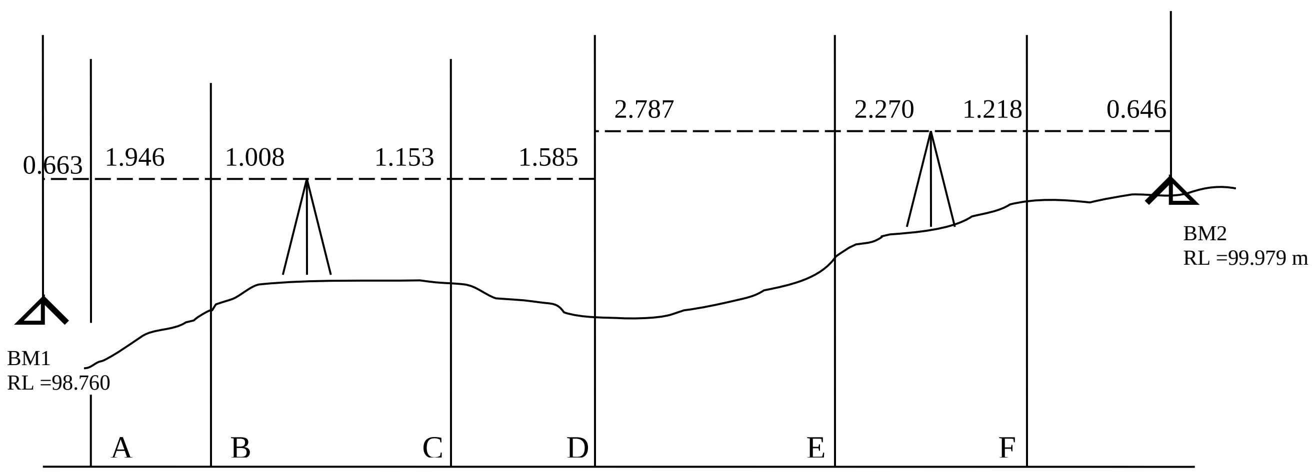
(a) Explain the difference between the following terms as used in levelling:
(i) "Level surface" and "Level line"
(ii) "Reduced level" and "Bench mark""
(iii)"Spot Height" and "Contour"
(iv)"Intermediate Sight" and "Change Point"
(v) "Backsight" and "Foresight"

(10 marks)

(b) Briefly explain the field procedures used in levelling so as to avoid many sources of error.

(5 Marks)

(c) Levelling was done down the centre line of a road for the purpose of production of a longitudinal section and this is shown schematically below with the level readings marked thereon.



Determine the reduced levels at the various staff stations by the Rise and Fall Method, applying the necessary arithmetical checks.

(10 marks)

QUESTION 4 **(25 Marks)**

(a) Define reciprocal levelling and state when it may be necessary (4 Marks)

(b) Reciprocal levelling involving a single level was used to transfer height across a river between two points R1 and R2 which were 70m apart. Using the following readings, calculate the height change from R1 to R2, the reduced level of station R2 and the collimation error in the level if the reduced level of R1 is known to be 94.360 m a.s.l.

Level set up close to R1: staff reading on R1 = 1.582 m
Staff reading on R2 = 0.792 m

Level set up close to R2: staff reading on R1 = 2.112 m
Staff reading on R2 = 1.336 m (6 Marks)

c) The leveling shown in the field sheet given below was undertaken during the laying out of a sewer line. Determine the height of the ground at each observed point along the sewer line and calculate the depth of the trench at points X and Y if the sewer is to have a gradient of 1 in 200 downwards from A to B and is to be 1.280 m below the surface at A.

B.S	I.S	F.S	Distance (m)	Remarks
3.417				B.M. 98.002 m
1.390		1.774	0	
	1.152		20	
3.551		1.116	40	Point X
0.732		1.088	60	
2.384		3.295	80	
	1.801		100	
	1.999		120	Point Y
1.936		2.637	140	Point B
		1.161		B.M. 100.324

(15 marks)