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UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC AGRIC 2, BSC AGRIC EDUC 2

COURSE CODE: LUM 202 (OLD PROGRAMME)

TITLE OF PAPER: LAND SURVEYING

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.

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GRANTED BY THE CHIEF INVIGILATOR

SECTION I: COMPULSORY QUESTION

QUESTION 1

(a)   With relevant examples, compare and contrast mistakes and errors.

(10 Marks)

(b)   It is not always possible to eliminate all mistakes and errors in linear measurements but they can be minimised and/or corrected.

A 30-m tape weighing 0.55kg and with a cross-sectional area of 0.02cm² was standardised and found to be 30.005m at 20°C, with 5-kg tension and supported at the 0 and 30-m points. This tape was used to measure a distance of about 89m over terrain of a uniform 5 per cent slope. The temperature was constant at 30°C, the tape was fully supported throughout, and tension of 5kg was applied to each tape length. The observed distances were 30.000m, 30.000m, and 29.500m. Calculate the horizontal distance between the points (taking into account the necessary corrections for systematic errors).
NOTE: refer to the appendix for relevant formulae.

(20 Marks)

(c)   Discuss two methods of making right angles, other than using the eye, when conducting a tape and offset survey.

(10 Marks)

SECTION II: ANSWER TWO QUESTIONS FROM THIS SECTION

QUESTION 2

(a)   Explain how one would use an Abney level to determine the height of an object on a slope (the object is positioned down-slope of the observer).

(10 Marks)

(b)   Outline the procedure for determining land slope using a line-level.

(10Marks)

(c)   Point R is to be set at a horizontal distance of 98.25m from point Q along a sloping line where the difference in elevation between R and Q is 4.35m. Calculate the slope distance to be measured in the field.
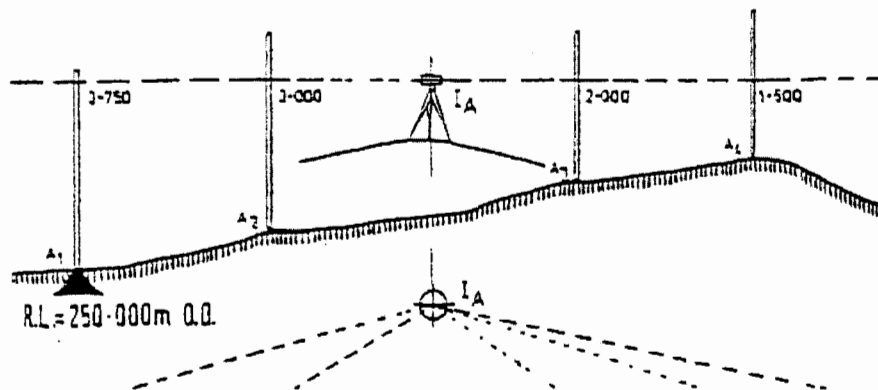
(10 Marks)

QUESTION 3

(a)   Define the following terms used in levelling:

     (i)   Datum;
     (ii)   Bench mark;
     (iii)   Backsight;
     (iv)   Change point.   (10 Marks)

(b)   In the figure below point A_1 is known to be 250.000m above O.D. Since the
     reduced level (R.L.) at A_1 is known, calculate the reduced levels of the other
     stations by the height of collimation and rise and fall methods.
                                                               (20 marks)

QUESTION 4

(a)   Define the following with respect to tape and compass traverse:

     (i)   Open traverse;
     (ii)   Whole-circle bearing;
     (iii)   Local attraction.   (15 Marks)

(b)   Discuss the following applications of levelling:

     (i)   Contouring;
     (ii)   Planning of roads;
     (iii)   Planning of underground services e.g. drains.   (15 Marks)

APPENDIX

$$correction\ for\ pull = (P - P_s)\frac{L}{(AE)}$$

where P, Ps = field and standard tensions respectively;
   A = cross-sectional area of band;
   E = Young's modulus of elasticity for the band;
   L = Length measured.

Correction for temperature = $\alpha L(t - ts)$

Where α = coefficient of linear expansion.
t = field temperature
ts = standardisation temperature

$$correction\ for\ slope = -\frac{h^2}{2L}$$

Where h = difference in level between points

$$correction\ for\ sag = -\frac{w^2 L^3}{24P^2}$$

Where w = weight per unit length of the tape