UNIVERSITY OF SWAZILAND
SUPPLEMENTARY 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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SECTION I: COMPULSORY QUESTION

QUESTION 1

(a) Briefly describe the following methods of making linear measurements:

(i) Pacing; (5 Marks)
(ii) Using a surveyor's chain; (5 Marks)

(b) A steel tape will normally be provided with standardisation data for correction of measured lengths to account for differences that arise from conditions other than those at standardisation.

In order to determine the horizontal distance between two points A and B set on the floor of a tunnel, measuring heads were set up over those points. A new 30m steel tape, standardised on the flat under a pull of 49N at 20°C, is suspended in catenary between the measuring heads, and a pull of 147N is applied. The mean tape readings at the measuring heads are observed to be 0.422m and 29.782m, and the difference in level between the heads is found to be 0.075m. Determine the corrected horizontal distance between the points A and B given the following:

Mean tape temperature during observation	= 26°C
Cross-sectional area of tape	= 0.406cm²
Mass of tape	= 0.27g/cm
Coefficient of linear expansion of steel	= 1.15×10^{-5}/°C
Modulus of elasticity of steel	= 207,000N/mm²

NOTE: The formulae in the appendix would assist you to arrive at the solution.
(20 Marks)

(c) Explain the fundamental differences between electro-optical and electromagnetic distance measuring instruments.
(10 Marks)

SECTION II: ANSWER TWO QUESTIONS FROM THIS SECTION

QUESTION 2

(a) Define plane surveying. (5 Marks)

(b) The surveying process comprises three distinct stages; outline each stage. (15 Marks)

(c) Linear measurements using a steel tape need to be corrected for tension, sag, temperature and height above mean sea level. Briefly explain the justification for each of the corrections. (10 Marks)

QUESTION 3

(a) Explain how the following surveying instruments are used.

(i) Surveyor's chain;
(ii) Abney level;
(iii) Compass. (15 Marks)

(b) (i) Define scale. (5 Marks)

(ii) On a plan of scale 1 in 600, the distance between two points was measured and found to be 428m. It was found afterwards that the scale used was 1 in 500. What was the true length? (10 Marks)

QUESTION 4

(a) Write short notes on the following:

(iii) Reconnaissance survey; (5 Marks)
(iv) Observation and measurement. (5 Marks)

(b) Outline the technique for tape and offset surveying. (20 Marks)

APPENDIX

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

where P, P_s = 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 = $\alpha L(t - t_s)$

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

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

Where h = difference in level between points

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

Where w = weight per unit length of the tape