KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE (WATER ENGINEERING)

SET 317: SURVEYING I

DATE: Tuesday 29th November 2011 TIME: 8.00a.m – 10.00a.m

INSTRUCTIONS

This paper consists of five (5) questions

Answer Question one (1) and Any other two!

Where necessary use Young's Modulus for steel, E = 200000 N/mm^2

Coefficient of thermal expansion for steel, α = 0.0000112 /°C

Question 1

a) List, with their formulae, the five corrections that apply to taping. **{5 Marks}**
b) On a construction site, a point R is set out from a point S using a 50 m steel tape. The horizontal length of SR is designed as 35.000 m.

   During the setting out the steel tape is laid on the ground and pulled at a tension of 70 N, the mean temperature being 4 °C. The reduced levels of S and R are 22.75 m and 24.86 m.

   The tape was standardised on site as 40.983 m at 50 N tension and 12 °C on a baseline of length 41.005 m and it has a cross sectional area of 2.4 mm^2.

   Calculate the length that should be set out on the tape along the direction SR to establish the exact position of point R. **{20 Marks}**

c) Discuss the circumstances under which you might choose to use a fibreglass tape instead of a steel tape for distance measurements on a construction site. **{5 Marks}**

Question 2

The extract given below is for levels taken between two TBMs. Calculate adjusted reduced levels for all entries in the book. **{20 Marks}**

BS	IS	FS	Remarks
1.592			TBM 31.317 m
1.675		2.052	CP
1.354		1.704	CP
1.326		0.907	Peg A
	1.397		Peg B
	1.384		Peg C
	1.406		Peg D
0.940		1.315	Peg E
0.832		1.507	CP
	(2.938)		Soffit 1
	(2.833)		Soffit 2
	(2.717)		Soffit 3
		1.546	TBM 30.007 m

Note: The readings in brackets () were taken with an inverted staff.

Question 3

a) Explain what a coordinate transformation is and why these are needed in surveying **{4 Marks}**

b) Explain how a bearing and distance can be converted into rectangular coordinate differences using a polar → rectangular conversion. **{6 Marks}**

c) The coordinates of two points A and B are known as E_A = 469.721 m, N_A = 338.466 m and E_B = 501.035 m, N_B = 310.617 m. Calculate the horizontal distance D_{AB} and whole-circle bearing θ_{AB} of line AB. **{10 Marks}**

Question 4

a) Instead of standard error, the precision of a measurement can be indicated by its weight. Describe how you would do this and explain how weight and standard error are linked. **{6 Marks}**

b) On a construction site, the difference in height between two control points is measured using different equipment and observers. The results and standard errors for these measurements are $H_1 \pm s_1$ = 3.539 ± 0.005 m and $H_2 \pm s_2$ = 3.550 ± 0.008 m. Calculate the most probable value of H and its standard error. **{14 Marks}**

Question 5

a) You are required to work to a linear tolerance of 2.5 mm on a construction site where the longest sighting distance expected is 50 m. What theodolite is required to meet this tolerance? **{4 Marks}**

b) What angles does a 5 mm width target subtend at 10, 20 and 50 m? **{6 Marks}**

c) The horizontal angle between two points is approximately 85°. If this is measured by a theodolite that is miscentred by 5 mm, what will be the centring error in the measured angle if both sighting distances are 30 m? If the sighting distances are increased to 65 m, what does the centring error reduce to? **{10 Marks}**