NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF CIVIL AND WATER ENGINEERING
FACULTY OF INDUSTRIAL TECHNOLOGY
BACHELOR OF ENGINEERING (HONOURS) DEGREE
PART II FIRST SEMESTER EXAMINATIONS- MAY-2009
ENGINEERING SURVEY I –TCW 2102

INSTRUCTIONS
Answer any four questions

Time : 3hours
Total marks : 100

QUESTION 1

A base line PR was measured in two sections with a tape and the field data recorded are as follows :

Line	Length(m)	Slope angle	Temperature	Tension	Catenary
PQ	99,895	$+ 2^0$	25^0c	51N	3 equal bays
QR	31,115	$+1^0$ 50'	26^0c	50N	1 bay

Other Data

Radius of the earth	=	6361km
Coefficient of linear expansion	=	$0{,}0000112/^0$c
Elevation (height)	=	1 500m
Standard temperature	=	22^0c
Standard tension	=	50N
Cross-sectional area of tape	=	$2mm^2$
Mass of tape	=	0,17kg/m
Young's Modulus for tape	=	$200kN/m^2$

Calculate the mean sea level distance PR. **(25 marks)**

QUESTION 2

(a) Fig.2a shows a cross-sectional area for an embankment on a road site which has got the following measurements :

Formation width	=	16m
Formation height	=	4m
Side slope	=	1: 2
Ground slope	=	1 : 12

Calculate the cross-sectional area for this embankment. **(10 marks)**

(b) A road is to be constructed on a hillside section as shown in fig.2b Given the following road parameters :
Road width = 20m
Existing ground slope = 1 in 5
Side slope in cut = 1 in 1
Centre height in cut = 1m
Side slope in fill = 1 in 2
Calculate the cross-sectional areas of cut and fill. **(10 marks)**

© Given the following information :
Horizontal distance intervals(m) : 0 , 50 , 100 150 , 200
Reduced levels (m) 500 , 450 , 550 , 575 and 600
Draw a longitudinal profile. **(5marks)**

(25marks)

QUESTION 3

(a) Define the following terms : bench mark , datum , change point and horizontal line. **(5marks)**

(b) Fig. 3b shows the longitudinal section for a straight length of a proposed road and a series of six cross-sections taken at right angles to the proposed centerline at 50m horizontal distance intervals. Calculate the total volumes of cut and fill required between the first and last cross-sections. **(20 marks)**

(25 marks)

QUESTION 4

A building site is to be excavated on a hill sloping at 10^0 to the horizontal. If the horizontal base of the site is tobe 40m by 40m and the sides of the excavation are to slope at 1m vertical to 1,5m horizontal as shown in fig. 4 , calculate the volume of earth to be excavated. **(20 marks)**

(b) A planimeter is traced over a circle of radius 8cm and the difference in readings obtained was 6,324 revolutions. At the same setting the planimeter was used to measure an area on a plan drawn to a scale of 1:200 and gave a reading of 8,713 revolutions. Calculate this area. **(5 marks)**

(25 marks)

QUESTION 5

(a) The following sets of readings were taken to test an automatic level

Set 1
Level set up midway between two pegs A and B , 60m apart horizontally.
Reading on the staff when held vertically at A = 1,608m
Reading on the staff when held vertically at B = 1,484m

Set 2
Level set up on the line AB extended , 6m from B horizontally.
Reading on the staff when held vertically at A = 1,455m
Reading on the staff when held vertically at B = 1,371m

Calculate the collimation error in the level per 60m of sight. **(20 marks)**

(b) Comment on the error . **(5 marks)**

(25 marks)

QUESTION 6

The following levels were taken over a stretch of ground where it is required to excavate a trench , 1,1metres wide with vertival sides for carrying a pipe at a downgrade of 1:50from A to F. The bottom of the pipe is to be 1,7metres vertically below A.Reduced elevation of A is 1300,000m and 1 cubic metre of water = 1 000litres.

Station	Distancefrom A	B.S.	I.S.	F.S
A	-	3,094		
B	15m		2,194	
C	37m		1,524	
D	56m	0,640		0,381
E	67m		1,143	
F	76m			2,652

Reduce the levels using the rise and fall method
Calculate
(i) the volume of of the excavation in cubic metres. **(20 marks)**

(ii) Assuming that a pipe of 0,762metres internal diameter is laid in the trench and that the depth of water in the pipe is 0,558metres with a linear velocity of 15metres per minute , calculate the flow in litres per hour. **(5 marks)**

(25 marks)

List of formulae

$A = \frac{X.\ Y^2.\ Z}{100^2}$ $A = \frac{(b-sh)}{2(s-n)}$ $A = \frac{(b+mh)}{2(s-m)}$

$W_1 = s\ \frac{(b-nh)}{s-n}$ $W_2 = s\ \frac{(b+mh)}{s-m}$

$V = h/3\ (A + 2\ O + 4\ E)$, $V = h/2\ [A1 + An + 2(\ A2 + A3 + \ldots\ldots AN-1)\ ]$

$W_l = s\ \frac{(b+nh)}{s+n}$, $W_g = s\ \frac{(\ b+nh)}{s-n}$, $A = 1/2\ (h+ b/n)\ (W_l + W_g) - b^2/n$

$C_s = L\frac{(l'-l)}{l}$, $C_t = L_m(t_f - t_s)\alpha$, $C_c = \frac{(mg)^2 L^3_m}{24T^2}$, $C_m = \frac{L_m h}{R+h}$

$V = 1/6(a +b+c)\ .l\ .h$, $C_T = \frac{T_f - T_s}{AxE}$