

**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE & QUANTITY SURVEYING
BACHELOR OF QUANTITY SURVEYING [HONOURS] DEGREE
PART II FIRST SEMESTER EXAMINATION – DECEMBER 2004**

ENGINEERING SURVEYING I – AQS 2102

TIME: 3 HOURS

TOTAL MARKS: 100

INSTRUCTION

Answer any **FOUR** Questions.
All Questions carry equal marks.

QUESTION 1

- a) The area of a square field was found to be 33124m^2 when measured with a 60m steel tape at a temperature of 12°C . If this steel tape had a coefficient of expansion of 0,000012 and was standardised at 20°C , what is the correct area? (5 marks)
- b) A planimeter used to trace over a circle of radius 8cm gave the following reading 6,324 revolutions. Using 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 in square metres. (5 marks)
- c) Calculate the volume, in cubic metres, of water contained in a dam, whose ground contours are shown in fig. (1) drawn to a scale of 1:100. A planimeter set to read 60cm^2 on a scale of 1:200 was used to planimeter each area enclosed by a contour and the following readings were obtained:

<u>Contour</u>	<u>Number of Revolutions</u>
112m	326,4
109m	282,2
106m	212,1
103m	150,0
100m	100,0

Calculate the volume using any two methods you learnt. (15 marks)

QUESTION 2

- a) List three advantages and two disadvantages of compass surveying. (5 marks)
- b) Eliminate the effects of local attraction from the following compass bearings. Tabulate your work and show the amount of adjustment and the adjusted angle. (10 marks)

AE 148⁰ 00'
 AB 78⁰ 30'
 BA 258⁰ 30'
 BC 90⁰ 30'
 CB 266⁰ 30'
 CD 173⁰ 00'
 DC 353⁰ 00'
 DE 161⁰ 00'
 ED 342⁰ 00'
 EA 325⁰ 00'

c) The following compass Bearings were taken in the Matopo when magnetic declination was N 8⁰ 50' W, calculate the correct Bearings: (5 marks)

AB 57⁰ 06'
 BA 239⁰ 36'
 BC 141⁰ 48'
 CB 329⁰ 54'
 CD 257⁰ 00'
 DC 72⁰ 48'
 DE 344⁰ 30'
 ED 164⁰ 30'
 EF 175⁰ 30'
 FE 357⁰ 00'

d) Write the following whole circle compass bearings as quadrant bearings (5 marks)

AB 246⁰ 30'
 BC 142⁰ 00'
 CD 320⁰ 00'
 DE 175⁰ 30'
 EF 66⁰ 30'

QUESTION 3

A building site is to be excavated on a hill sloping at 10⁰ to the horizontal. If the horizontal base of the site is to be 40m by 40m and the side of the excavation are to slope at 1m vertical to 1,5m horizontal, calculate the volume of earth to be excavated.

(25 marks)

QUESTION 4

STATION	B.S.	I.S.	F.S.	R.L	HORIZONTAL DISTANCE FROM BM82 (m)
B.M. 82	2,383			+328,452	-
Peg 1	1,730		3,151		27
Peg 2	1,134		1,360		65
Peg 3	1,980		1,511		110
Peg 4		1,321			153
Peg 5	2,387		1,256		193
Peg 6		1,925			227
Peg 7		2,561			269
Peg 8	1,052		1,865		300
Bridge 1		2,747			314
Bridge 2		2,819			364
Peg 9	1,183		0,845		380
Bridge 3	2,842		2,595		414
Peg 10		1,408			450
Peg 11	1,200		1,638		475
Peg 12	2,374		1,560		500
B.M. 127			0,733	+329,709	514,320

The levelling notes above are of a levelling traverse starting from B.M.82 and closing on B.M. 127 as a check. The readings were taken along the centre-line of a road, at chainages (distances) shown. This section of the road is to be regarded as follows:

- (i) On an even up-grade from B.M. 82 to allow a clearance of 2,700m under bridge 1,
- (ii) Thereafter on an even down-grade from bridge 1 to B.M. 127. Calculate using the collimation (H.O.C) method only;
 - (a) the required grades as in (i) and (ii) above
 - (b) the amount of cut or fill required at each point.No cut or fill is to be done at B.M.82.

(25 marks)

QUESTION 5

It is required to lay a pipe in a trench in a straight line from A to H. From the levelling notes below, calculate the cut required at each of the survey stations in order that the bottom of the trench will be on an even grade of 1:120 down from A to H. The cut at A is to be 3,000m. Use the rise and fall method.

(25 marks)

STATION	B.S.	I.S.	F.S.	R.L	HORIZONTAL DISTANCE FROM P (m)
A	3,250			1412,00	-
B		3,200			60
C		2,160			108
D	1,630		3,870		168
E		2,540			288
F	3,630		2,290		396
G		2,910			498
H			4,360		600

QUESTION 6

- a) A straight section of a proposed road having a formation width of 7,30m is to be constructed as a cutting having sides slopes of 1 in 2. At the particular cross section shown in fig. 6 the depth to formation level at the centreline is 4,88m. Calculate the area of this cross-section. (10 marks)

An access road to a mine is to be constructed to rise at 1 in 20 across a hillside having a maximum slope of 1 in 10. The road is to have a formation width of 4,5m and the volumes of cut and fill are to be equalised. Calculate the width of the cutting and the volume of excavation in 30m of road.

Side slopes are to batter at 1 in 1 in cut and 1 in 2 in fill.

(15 marks)

END OF EXAMINATION