



University of Technology, Sydney

**TO BE RETURNED AT THE END OF THE EXAMINATION.
THIS PAPER MUST NOT BE REMOVED FROM THE EXAM CENTRE.**

SURNAME: _____

FIRST NAME: _____

STUDENT NUMBER: _____

COURSE: _____

SPRING SEMESTER, 2012

SUBJECT NAME: SURVEYING

SUBJECT NO.: 48320

DAY/DATE: 21 NOVEMBER 2012

TIME ALLOWED: THREE Hours plus TEN Mins reading time

START/END TIME: 9:30 am - 12:40 pm

NOTES/INSTRUCTIONS TO CANDIDATES:

Attempt ALL questions.

Write the answers in the spaces provided.

The questions are NOT of equal value. Marks for each part of a question are shown adjacent to that part of a question.

THIS IS A CLOSED BOOK EXAM.

Calculators and drawing instruments are allowed.

Formulae are provided at the end of the examination paper.

All of the diagrams are sketches for illustrative purposes and are not to scale,

If not enough room has been provided for calculations or written answers, please use the back of adjacent pages and note this fact, so the marker can see your complete answer or working.

QUESTION 1 (14 Marks)

A traverse was run from A via points B, C, and D, to finish on a point S, whose coordinates have been previously accurately established.

The coordinates of S are 923.500 E, 900.000 N

Complete the traverse table below to find the coordinates of each traverse point, the linear misclose and the proportional accuracy of the traverse. **(8 Marks)**

Using the data on the sketch plan calculate the coordinates of point X. **(2 Marks)**

Calculate the bearing and distance of the line C - X. **(4 Marks)**

LINE	Adjusted Bearing	Horiz. Dist	Δ E		Δ N		CO-ORD INATES		PT.
			E (+)	W (-)	N (+)	S(-)	E	N	
							540.000	758.000	A
A-B	84 – 16 – 00	65.120							B
B-C	123 – 45- 00	151.760							C
C-D	100 – 52 - 00	127.450							D
D-S	15 – 26 - 50	252.990							S
							540.000	758.000	A
A-X									X
									C
C- X									X

Traverse Linear Misclose Proportional Accuracy
 Show coordinates of B, C, D, S and X in the traverse table above.

Bearing and distance of line C X

QUESTION 2 (19 Marks)

A surveyor has to accurately mark out a circular curve for a landscaper building a driveway on a property.

The starting and finishing points 'A' and 'B' have been marked approximately and a radius of 13.0m is required. The surveyor measured the distance from the mid point on the chord AB to the approximate proposed position of the crown of the curve (Y) as shown on the sketch plan below.

i) Calculate the **exact** deflection angle (to the nearest second) using the shown data for the proposed driveway. **(4 Marks)**

As the curve is so small, it was then decided to adopt a deflection angle of $77^{\circ} 00'$ for the set out. **Please use 77° for all the following calculations.**

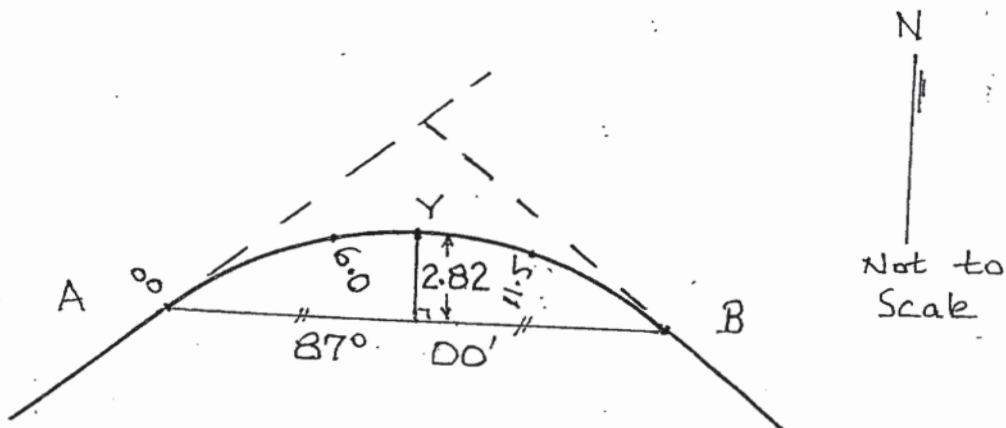
ii) Calculate the following set out information:

a) Tangent Length **(2 Marks)**

b) Chord Length **(2 Marks)**

c) The chainage of the second tangent point B. **(3 Marks)**

d) Bearings and Distances to set out points on the driveway 6.0m and 11.5m around the arc from the starting point A. (AB has a bearing of $87^{\circ} 00'$.) **(8 Marks)**



ANSWERS

i) Exact Deflection Angle of Driveway

ii)

a) Tangent Length b) Chord Length

c) Chainage of T.P. B

c) Bearings and Distances to set out

6.0 m,

11.5 m,

QUESTION 3 (20 Marks)

A vertical curve is to be designed on a road, to join a falling grade of 5.0 % to a rising grade of 7.0%. The Low Point on the curve is planned to be very close to chainage 737.4 for drainage reasons and the Intersection Point is fixed at chainage 750.0m and R.L. 54.60m.

- a) Calculate the EXACT length of the vertical curve to meet the above requirements. (6 Marks). For the rest of the question, or if you can not find the length asked for in part a), please adopt 150m and continue.
- b) Calculate the chainages and R.L.s of T.P.1 and T.P. 2 and place them into the table below. (2 Marks)
- c) Complete the table below calculating the grade levels, ordinates and design levels at ALL the points nominated on the table, including T.P.1 and T.P. 2. (8 Marks)
- d) Calculate how far away from the planned Low Point the real Low Point will now be and the R.L. of the real Low Point. (4 Marks)

Chainage	Grade	Grade Level	Ordinate	Design Level
T.P.1	↑			
710	-5%			
L.P.	↓			
I.P. 750.0	↑	54.60		
780	+7%			
T.P. 2	↓			

ANSWERS

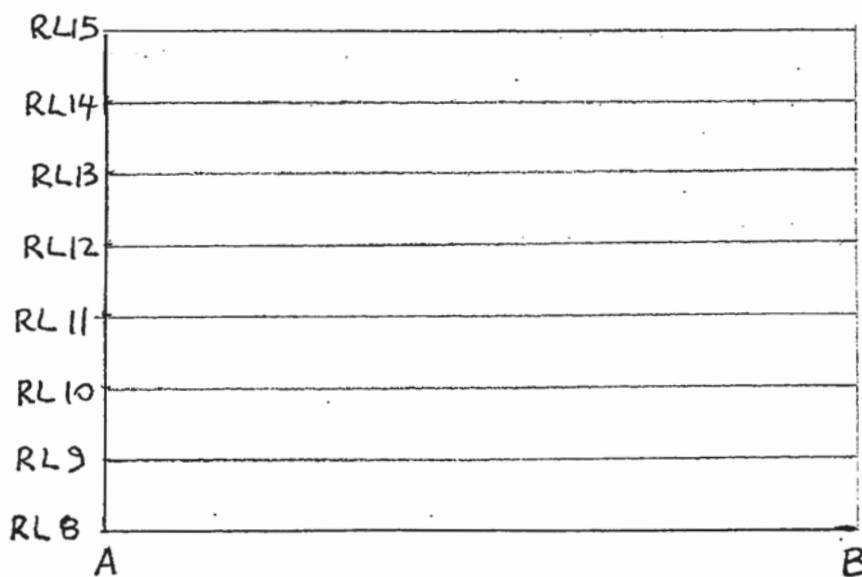
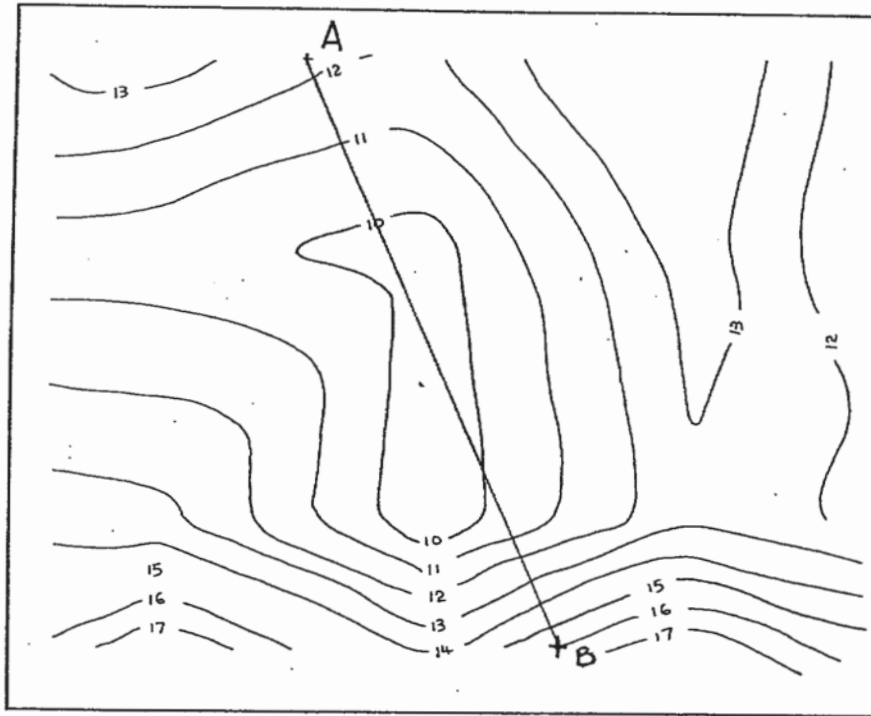
- a) Exact length of vertical curve
- b) Enter chainages and R.L.s of T.P.1 and T.P. 2 into the table.
- c) Complete other values in the table.
- d) Distance of real Low Pt. from planned Low Pt.
R.L. of real Low Pt.

QUESTION 4 (7 marks)

The plan below shows contours over an area of land.

In the space provided, draw a longsection between points "A" and "B".

The horizontal scale for the longsection is the same as the plan, and the vertical scale is shown on the longsection template provided.

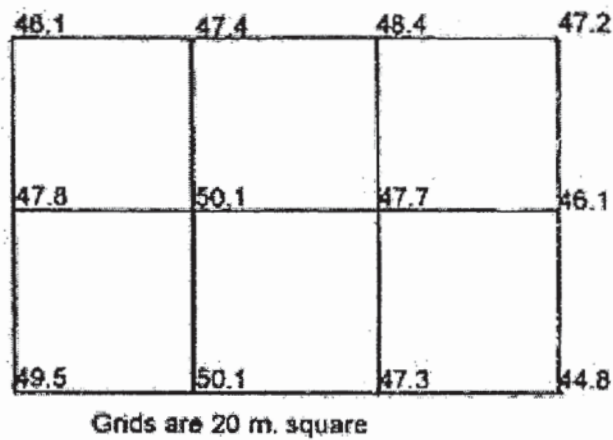


QUESTION 5 (20 Marks)

(a) (12 marks)

The figure below shows natural surface levels taken at the corners of a 20 metre square grid over a site which is to be excavated and filled to RL 47.0m.

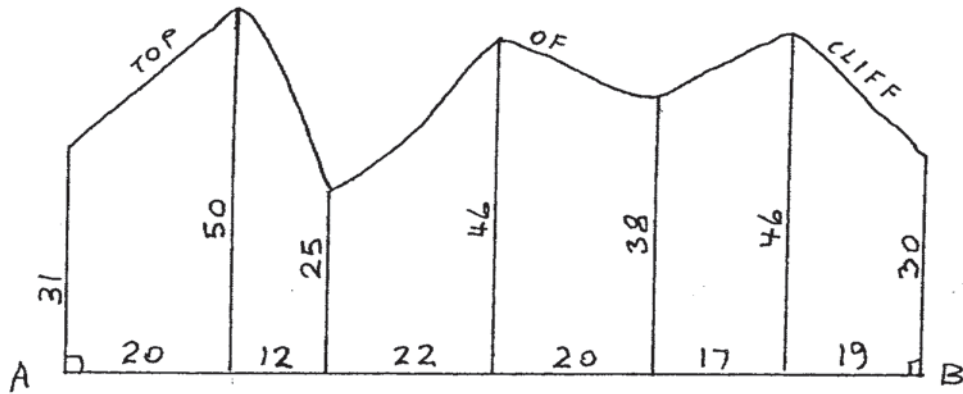
- i) **(4 marks)** Sketch the position of the contours over the land to a contour interval of 2 metres. Interpolate the contours by eye - do not calculate their position.
- ii) **(8 marks)** Calculate the depth of excavation or fill at each grid intersection point and then calculate the net volume of material to be removed from the site after the area has been graded to the required level.



b) (8 marks)

A survey was carried out on a block of land as shown below, to determine the area between the baseline AB and the top of the cliff line. Distances were measured as shown perpendicular from the baseline AB to the top of the cliff.

Calculate the total area between the baseline and the top of the cliff.



QUESTION 6 (20 Marks)

In the following questions select the BEST answer from the selections given.

1) (2 marks)

An Easement over a property:

- a) Gives a property owner the right to use another person's land for a particular purpose
- b) Is extinguished when an owner sells the property
- c) Prevents an owner of a property from subdividing the land
- d) Provides the Council with Zoning information

2) (2 marks)

A Certificate of Title of a parcel of land:

- a) Shows the Zoning of the land
- b) Shows the Registered Proprietor of the land
- c) Shows if there is a development proposed on the land
- d) Shows Reduced Levels over the land.

3) (2 marks)

A Total Station instrument does NOT do the following:

- a) Record angular measurements
- b) Record distance measurements
- c) Determine the bearing of a line
- d) Can download data into a computing package

4) (2 marks)

The following information is NOT contained on a Deposited Plan:

- a) The Lot number of the parcels of land
- b) The Area of the parcels of land
- c) Survey information to re-locate the boundaries
- d) The street address of the parcels

5) (2 marks)

Of the following which surveys can only be prepared by a Registered Surveyor:

- a) Pegging a pipeline for construction of a sewer
- b) Detail and level survey over a block of land
- c) Marking a boundary of a block of land
- d) Setting out the position of the centreline of a driveway

In the following questions briefly answer the questions in the space provided.

6) (5 marks)

On a high rise construction site list 5 surveys which would be carried out by a Registered Surveyor:

7) (5 marks)

List two advantages and two disadvantages of using GPS to measure a distance between two points compared to conventional measurement methods.

$$C_{slope} = -L \times (1 - \cos \beta)$$

$$C_{slope} = -\left[\frac{\Delta h^2}{2L_n} + \frac{\Delta h^4}{8L_n^3} \right]$$

$$C_{temp} = \pm L \times \alpha \times (\Delta t)$$

$$\alpha_{steel} = 11,2 \times 10^{-6} / ^\circ C$$

$$C_{sag} = \frac{w^2 L^3}{24 \times T^2} \times \cos^2 \beta$$

$$Grade = \frac{\Delta h}{HorDist} \times 100$$

$$OM = \frac{L \times (G_1 - G_2)}{800}$$

$$PQ = \frac{4 \times m^2 \times OM}{L^2}$$

$$PQ = \left(\frac{G_2 - G_1}{200L} \right) \times x^2$$

$$d = \left(\frac{G_1}{G_1 - G_2} \right) \times L$$

$$H = 100 \times s \times \cos^2 \theta$$

$$V = 100 \times s \times \sin \theta \times \cos \theta$$

$$RLS = RL_T + HI + V - m$$

$$Tangent Dist. = R \tan \frac{\Delta}{2}$$

$$Secant Dist. = R \sec \frac{\Delta}{2}$$

$$External Dist. = R \left(\sec \frac{\Delta}{2} - 1 \right)$$

$$Mid Ord = R \left(1 - \cos \frac{\Delta}{2} \right)$$

$$Chord = 2R \sin \frac{\Delta}{2}$$

$$Arc = R \theta^{rad}$$

$$Arc = R \theta^{deg} \times \frac{\pi}{180}$$

$$\delta = \frac{arc}{2R} \times \frac{180}{\pi}$$

$$Chord = 2R \sin \delta$$

$$y_0 = R - \sqrt{R^2 - \left(\frac{c}{2} \right)^2}$$

$$y_1 = y_0 - \left[R - \sqrt{R^2 - x^2} \right]$$

$$Area = \pi R^2$$

$$Sector = \frac{1}{2} R^2 \theta$$

$$Segment = \frac{1}{2} R^2 (\theta - \sin \theta)$$

$$Area = w \left(\frac{O_1 + O_2}{2} \right)$$

$$Volume = \frac{\pi}{2} (A_1 + 2A_2 + 2A_3 + \dots + 2A_{n-1} + A_n)$$

$$Volume = \frac{w}{3} \left\{ A_1 + 4A_2 + 2A_3 + \dots + 2A_{n-1} + A_n \right\}$$

$$Volume = \frac{Area}{4} (\Sigma d_1 + \Sigma 2d_2 + \Sigma 3d_3 + \Sigma 4d_4)$$

FINAL EXAM
48320 SURVEYING
21/11/12

DIAGRAM FOR
QUESTION 1

