University of Technology, Sydney

Cover Page - Type B

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TO BE RETURNED AT THE END OF THE EXAMINATION

SURNAME : _____

FIRST NAME: _____

STUDENT NO.: _____

COURSE : _____

SPRING SEMESTER EXAMINATION 1998

SUBJECT NO. 48320

SURVEYING

CIVIL ENGINEERING DEGREE COURSE

FRIDAY, 27 NOVEMBER 1998

9:30 am - 11:40 am

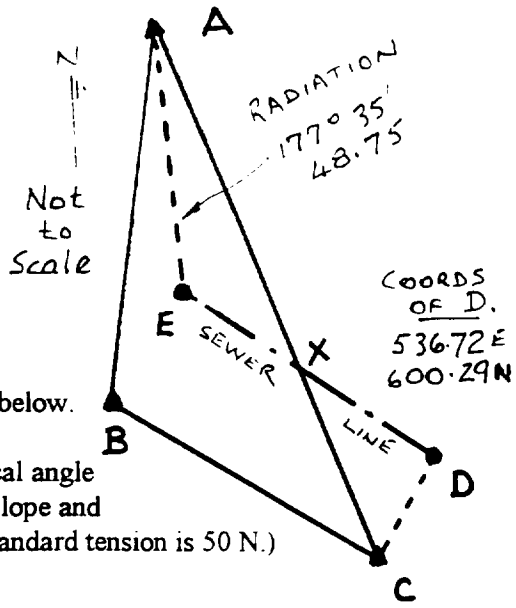
Time Allowed: 2 Hours plus 10 minutes reading time

Attempt ALL questions.
Write the answers in the spaces provided.
The questions are NOT of equal value. Marks for each part 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.
If not enough room for working has been provided, please use the back of adjacent pages.

QUESTION 1 (22 Marks)

A closed traverse, ABC, was run. Points A and C lie on the centre line of a straight road.

At stations A and C, radiations were taken to the centre of the top of sewer access chambers E and D, which are exactly over the centre of the sewer pipe. The bearing and distance of the radiation to E is shown on the diagram at right. (The coordinates of D are given)



The traverse data for lines A-B and B-C is shown in the traverse table below.

Line C - A : Bearing 8° 29' 00", *Observed Dist.* 130.460 at a vertical angle of 1° 30'. The wire was laid along the road which was at a constant slope and standard temperature and tension applied. (Standard temp 20° C and standard tension is 50 N.)

The coordinates of point A are 500.00 E and 700.00 N

Calculate:
a) the horizontal distance AC, **(2 Marks)**
b) the traverse close ABC to find the coordinates of B and C, the linear misclose and the proportional accuracy. **(10 Marks)**
c) the coordinates of E. **(2 Marks)**
d) the bearing and distance of the sewer line ED. **(2 Marks)**
e) the coordinates of point X where the sewer line crosses the road. **(6 Marks)**

LINE	Adjusted Bearing	Dist	Δ E		Δ N		CO-ORD INATES		PT.
			E (+)	W (-)	N (+)	S(-)	E	N	
							500.000	700.000	A
A-B	235° 11' 20"	125.070							B
B-C	124° 35'20"'	101.350							C
C-A	8° 29' 00"								A
							500.000	700.000	A
A-E	229° 45' 30"	64.520							E

Horizontal length of CA .....

Traverse Linear Misclose ..... Proportional Accuracy .....
Show coordinates of B, C and E in the traverse table.

Bearing and distance of line E - D .....

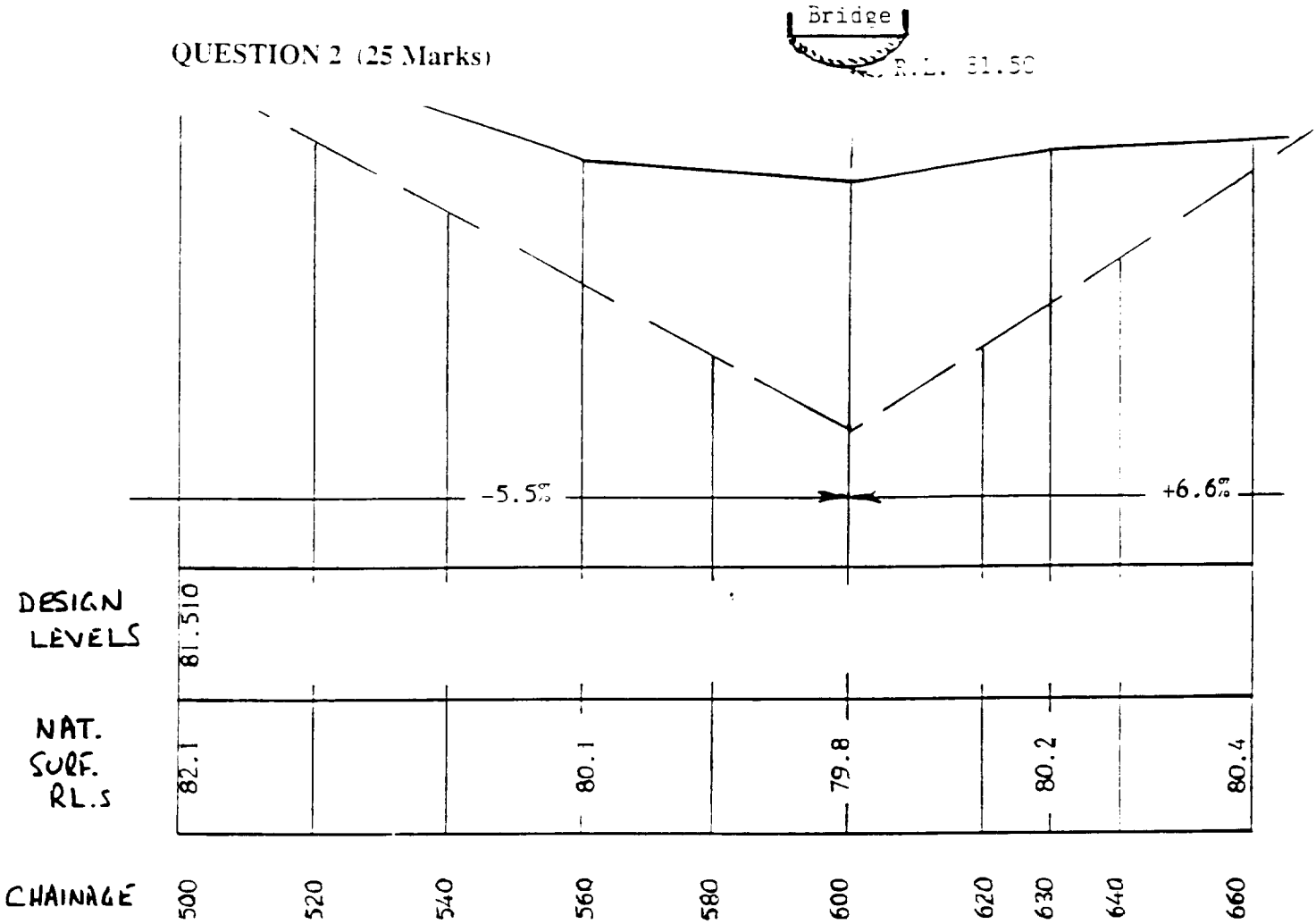
Coordinates of X ....

P.T.O.

WORKING SPACE FOR QUESTION 1

P.T.O.

QUESTION 2 (25 Marks)



The Longsection shown above is for the design of a new road to pass under a railway bridge, which can not be moved. The road must have a clearance of 3.8m between the road surface and the underside of the bridge.

Calculate the length of the vertical curve that will exactly satisfy this requirement. Round your answer to the nearest even 10m and then calculate the design levels for the chainages shown on the longsection and also the Tangent Points of the vertical curve. Write those answers neatly onto the longsection in the correct positions.

Calculate the Chainage and Reduced Level of the Low Point of the curve.

ANSWERS

a) (7 Marks) Precise Length of Vertical Curve .....

Therefore adopt, L = ...

b) (12 Marks) Design Levels ---- see Plan

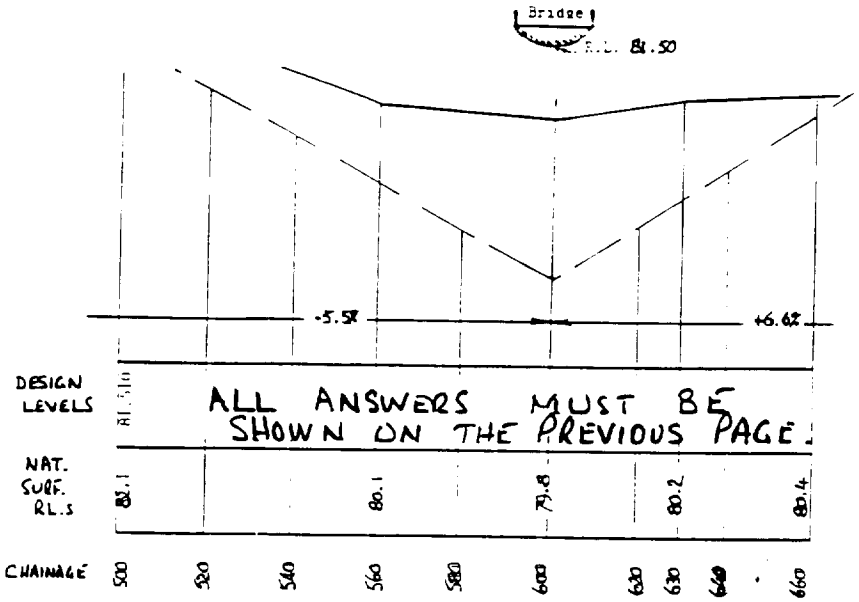
c) (6 Marks) Low Point Chainage .....

R.L. .....

NOTE If you can not calculate part a) or get an answer for L which does not fit on the plan, adopt L=110m and continue with parts b) and c).

P.T.O.

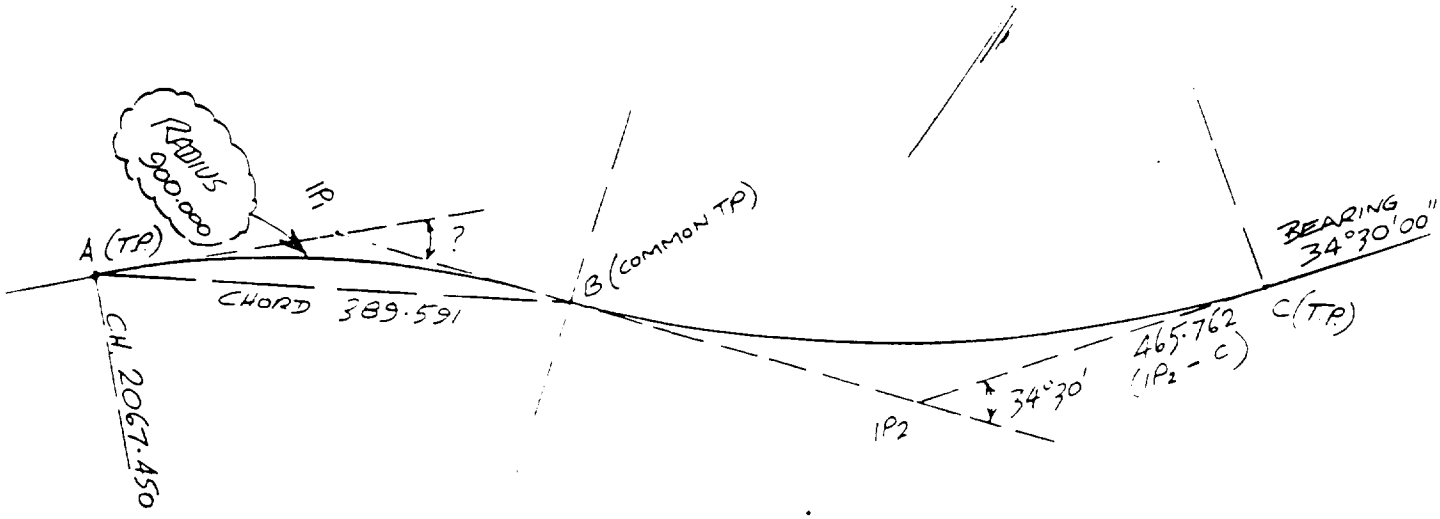
WORKING SPACE FOR QUESTION 2



P.T.O.

QUESTION 3 (17 Marks)

The diagram below shows a reverse curve starting at T.P. "A". Calculate the information required in the answer section at the bottom of the page.



a) (2) Chainage of "B" .....

b) (2) Radius of the second curve .....

c) (3) Chainage of "C" .....

d) (3) Distance IP1 to IP2 .....

e) (3) Bearing "A" - IP1

f) (4) Deflection angle and chord from "A" to set out chainage 2100.00 .....

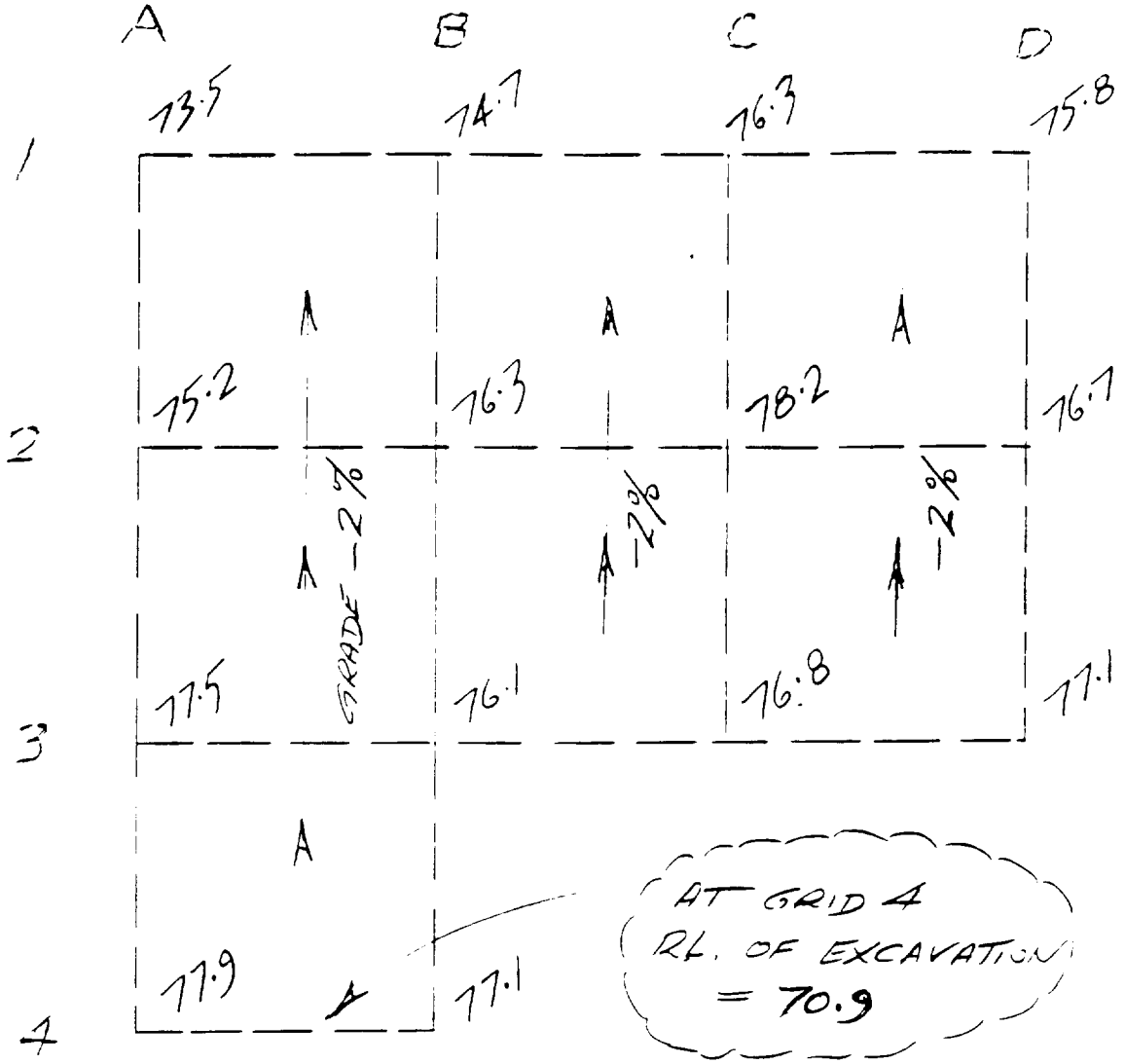
P.T. O.

QUESTION 4 (13 Marks)

The plan below shows a 10m x 10m grid on a building site which is about 30m square. Excavation has to be made for the basement and the sides of the excavation are to be vertical. The bottom of the basement is to have a 2% grade falling to the north and the R.L. of the basement at grid line 4 is to be 70.9m

Calculate the depths of excavation at each grid point and mark them onto the diagram. Calculate the total volume of material to be removed.

NKH.

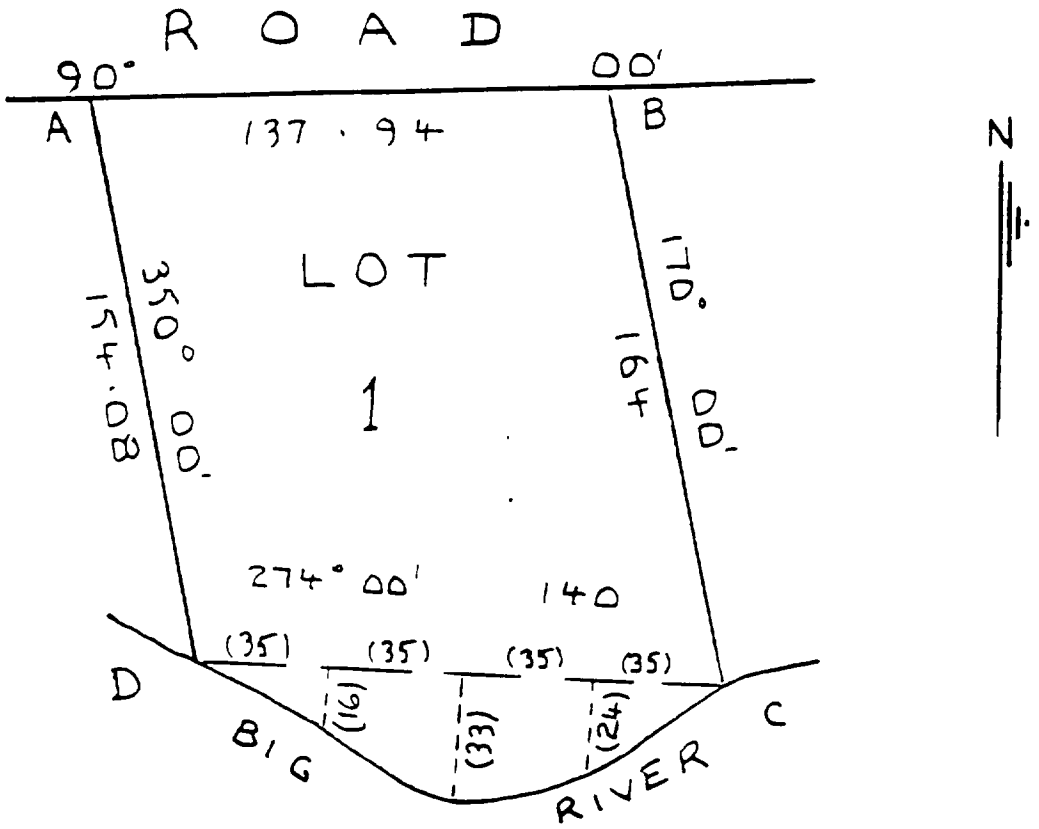


VOLUME TO BE REMOVED .....

P.T.O.

QUESTION 5 (10 Marks)

Determine the total area of Lot 1 shown in the plan below. The offsets are at right angles to the traverse line and you should use the trapezoidal rule for the offset area.



ANSWERS

Area within the traverse lines ABCD .....

Offset Area ..... Total Area of Lot 1 .....

P.T.O.

QUESTION 6 (13 Marks)
For each question, please write a brief answer in the space provided.

a) What is meant by the term "Cadastral Surveys"? **(2 Marks)**

b) Who are the only people permitted by law, to undertake cadastral surveys?
What is the name of the body or group who keeps the list of these approved people? **(4 Marks)**

P.T.O.

e) Modern Total Stations have become very sophisticated instruments. Briefly describe what a "Total Station" actually is. **(3 Marks)**

f) What is it about the most modern Total Stations, that makes them more "sophisticated" than the first versions of Total Stations that were marketed about five years ago. **(4 Marks)**

P.T.O.

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

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

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

$\alpha_{steel} = 11.2 \times 10^{-6}/^0C$

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

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

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

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

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

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

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

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

$RL_S = RL_T + HI + V - m$

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

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

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

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

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

$Arc = R\theta^{rad}$

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

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

$Chord = 2R\sin\delta$

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

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

$Area = \pi R^2$

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

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

$Volume = \frac{w}{2}\left(A_1 + 2A_2 + 2A_3 + \ldots\ldots 2A_{n-1} + A_n\right)$

$Volume = \frac{w}{3}\left\{A_1 + 4A_2 + 2A_3 + \cdots + A_n\right.$

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