Cover Type B

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, 2001

SUBJECT NAME: SURVEYING

SUBJECT NO.: 48320

DAY/DATE: MONDAY 19 NOVEMBER 2001

TIME ALLOWED: TWO Hours plus TEN Mins reading time

START/END TIME: 9:30 am - 11:40 am

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 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 (16 Marks)

A closed traverse was run from A via points B, C, and D, as indicated on the traverse close form below.
Radiations were made to points X and Y, access chambers over a pipeline.
(The traverse is shown in a diagram on the next page.)

Compute the traverse misclose and the proportional accuracy of the traverse. **(5 Marks)**
Without making any adjustments, calculate the coordinates of each traverse point. **(4 Marks)**
Calculate the coordinates of points X and Y. **(4 Marks)**
Calculate the bearing and distance of the line XY. **(3 Marks)**

A diagram of the traverse with extra working space is shown on the next page.
(Please work to three decimal places)

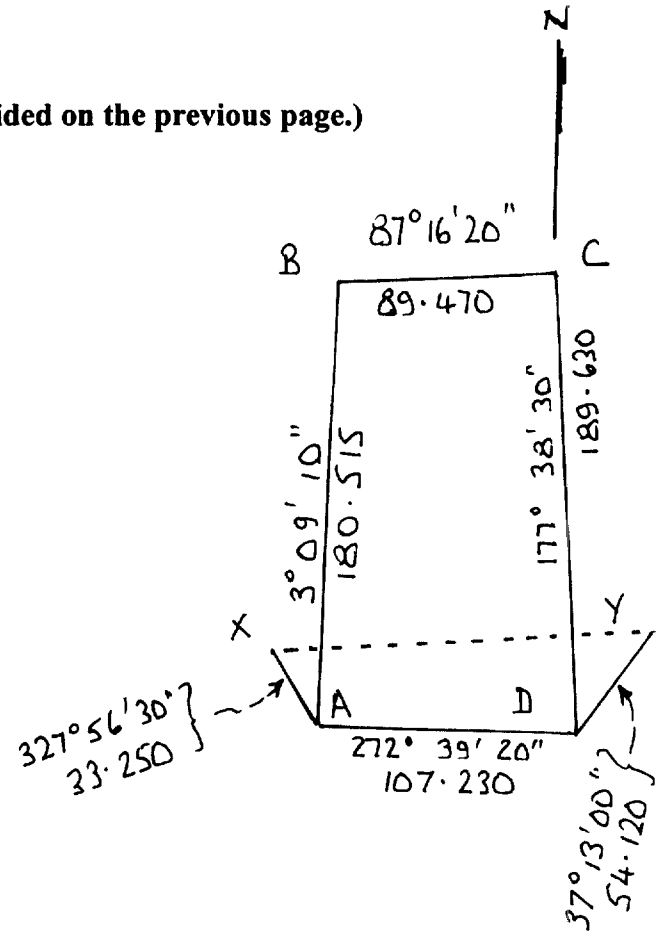
LINE	Adjusted Bearing	Horiz. Dist	Δ E		Δ N		CO-ORD INATES		PT.
			E (+)	W (-)	N (+)	S(-)	E	N	
							400.000	1562.000	A
A-B	3° 09' 10"	180.515							B
B-C	87° 16' 20"	89.470							C
C-D	177° 38' 30"	189.630							D
D-A	272° 39' 20"	107.230							A
							400.00	1562.000	A
A-X	327° 56' 30"	33.250							X
									D
D-Y	37° 13' 00"	54.120							Y

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

Bearing and distance of line X-Y .....

P.T.O.

WORKING SPACE FOR QUESTION 1
(Please write your answers in the spaces provided on the previous page.)



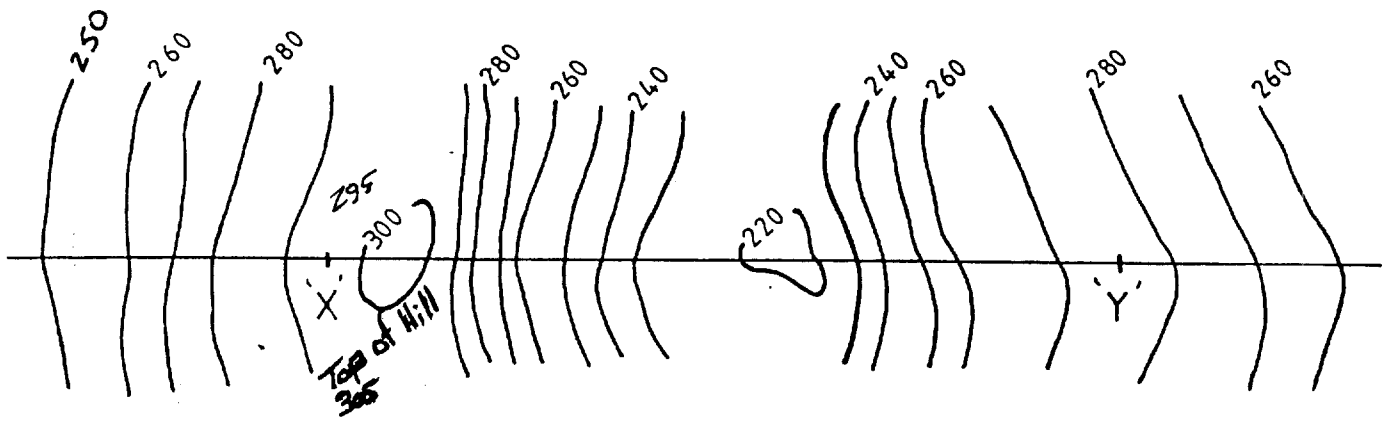
P.T.O.

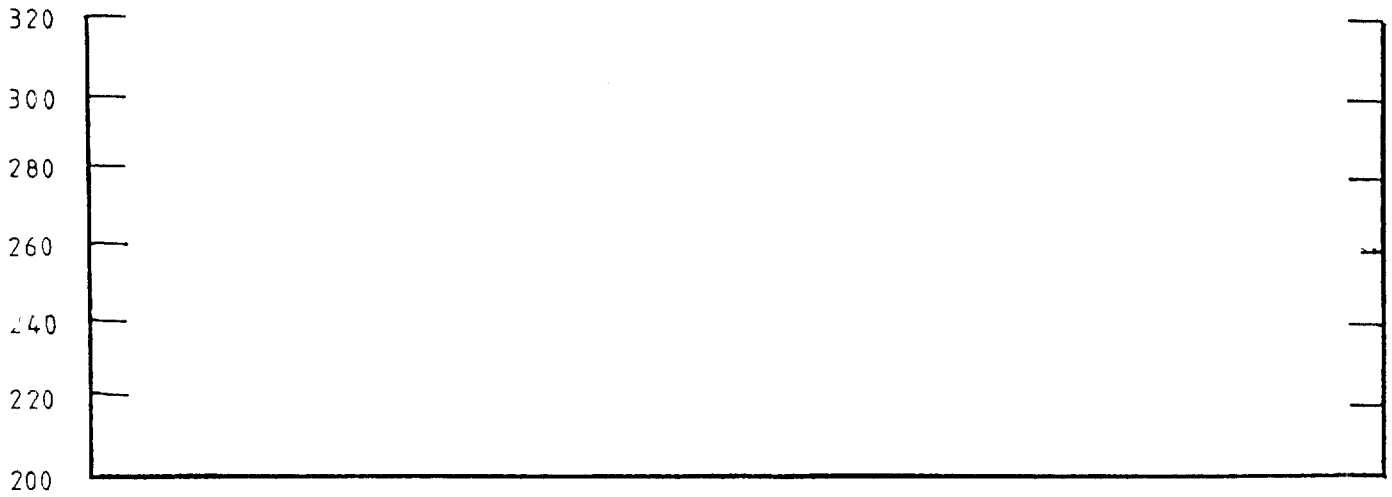
QUESTION 2 (10 Marks)

On the contour plan below, X is the location of a proposed 10m tall building and Y is the location of an existing garbage tip.

Sketch the profile of the line AB in the space below the contour plan.

If the proposed building is erected, would a 2m tall person standing on the roof of the building, be able to see the garbage tip or not.





Is the garbage tip visible? .....

P.T.O.

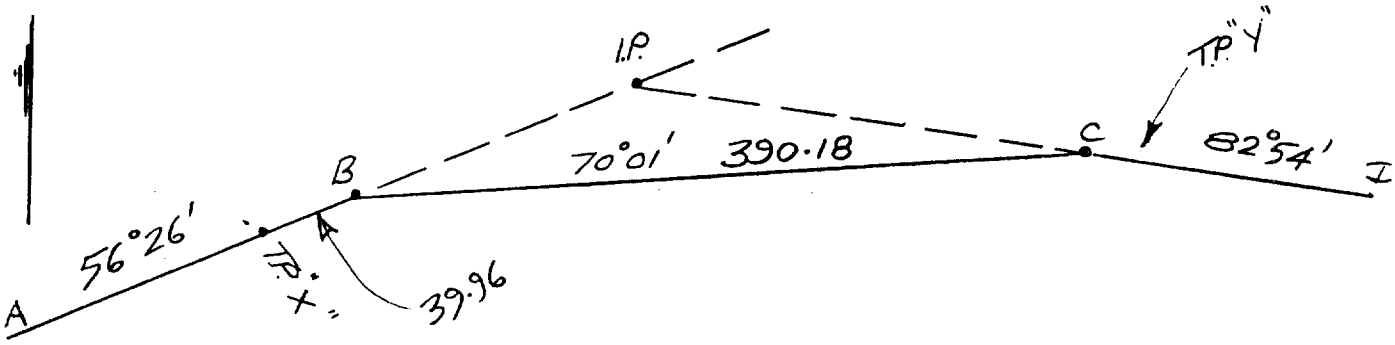
QUESTION 3 (20 Marks)

It is proposed to upgrade a road with a horizontal circular curve. The Intersection Point is inaccessible so a connection was made between the two points B and C as shown on the sketch below. The first tangent point (T.P.'X') must be located 39.960m southwest of point B, as shown.

Point B is known to have a running chainage of 8736.570m.

Calculate the following and show your answers to three decimal places.

a) the radius of the curve to fit this situation. (N.B. If you can not calculate a radius; or get an answer that is no where near 950m, adopt R=950.0m and continue)
b) The chainages of both tangent points and the crown point.
c) The distance from the I.P. to the C.P.
d) The length of the long chord.
e) The deflection angle and chord needed to set out running chainage 8800.00, from T.P.'X'.



ANSWERS

a) Radius required = ... / or adopt R=950.00

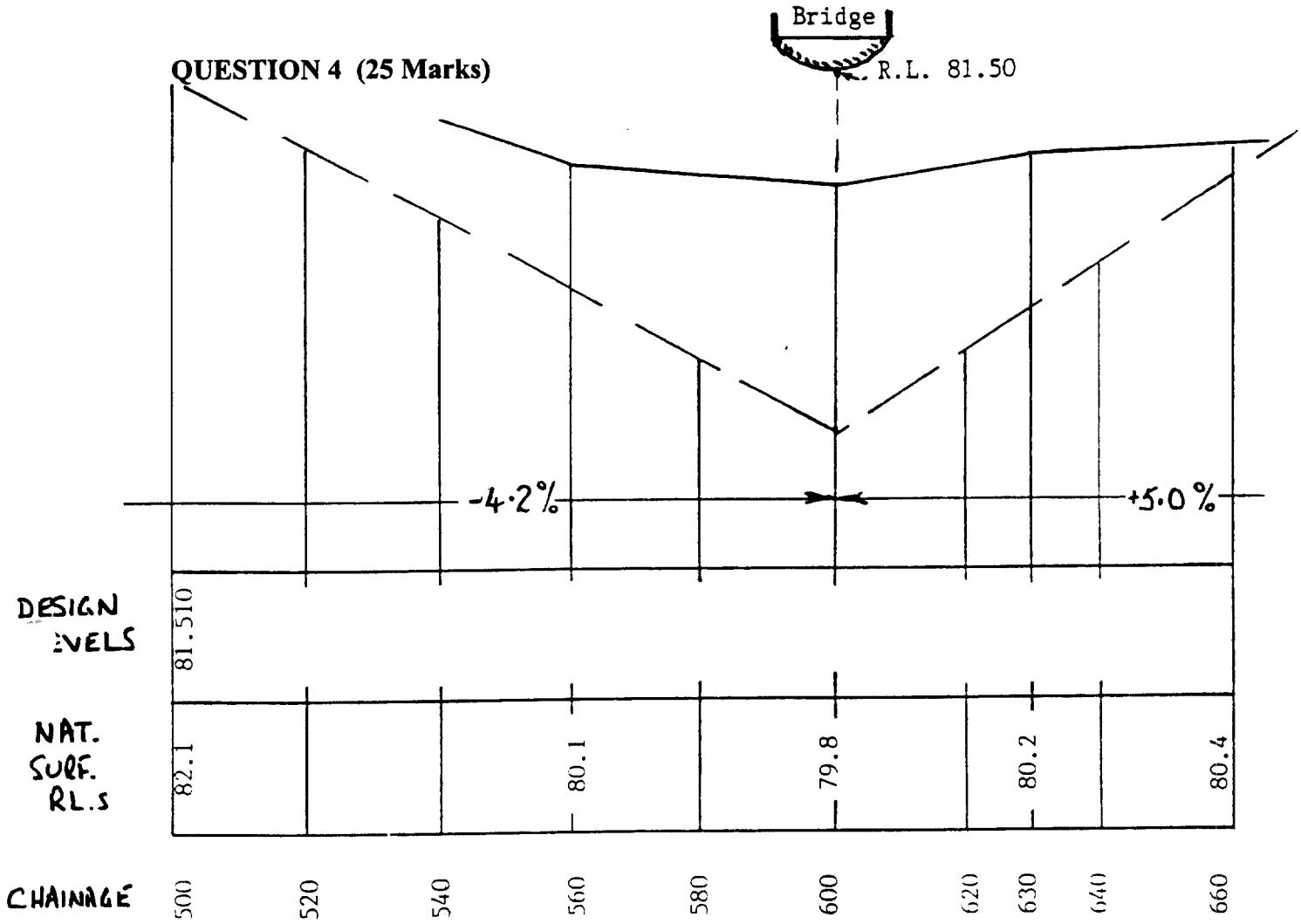
b) Chainages T.P. 1 ....., T.P. 2 ....., Crown Point .....

c) Distance I.P. to C.P. ..... d) The Long Chord Length .....

e) Set Out data for 8800.00
Deflection Angle....., Chord .....

P.T.O.

QUESTION 4 (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 **exactly 3.04m** between the finished 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.

There is working space with a diagram on the next page, but all answers must be shown on this page in the spaces indicated.

ANSWERS

a) (7 Marks) Precise Length of Vertical Curve ..... Therefore adopt, L = ...

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

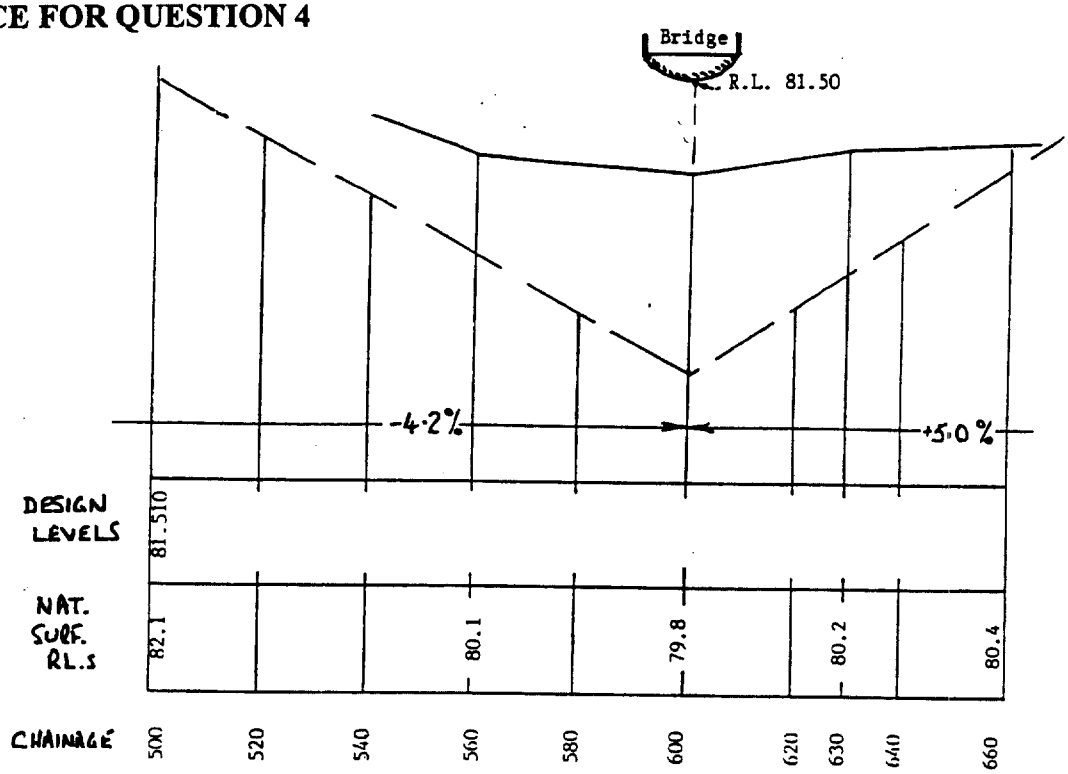
c) (6 Marks) Low Point Chainage .....

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 4



CHAINAGE	GRADE	GRADE LEVEL	ORDINATE	DESIGN LEVEL

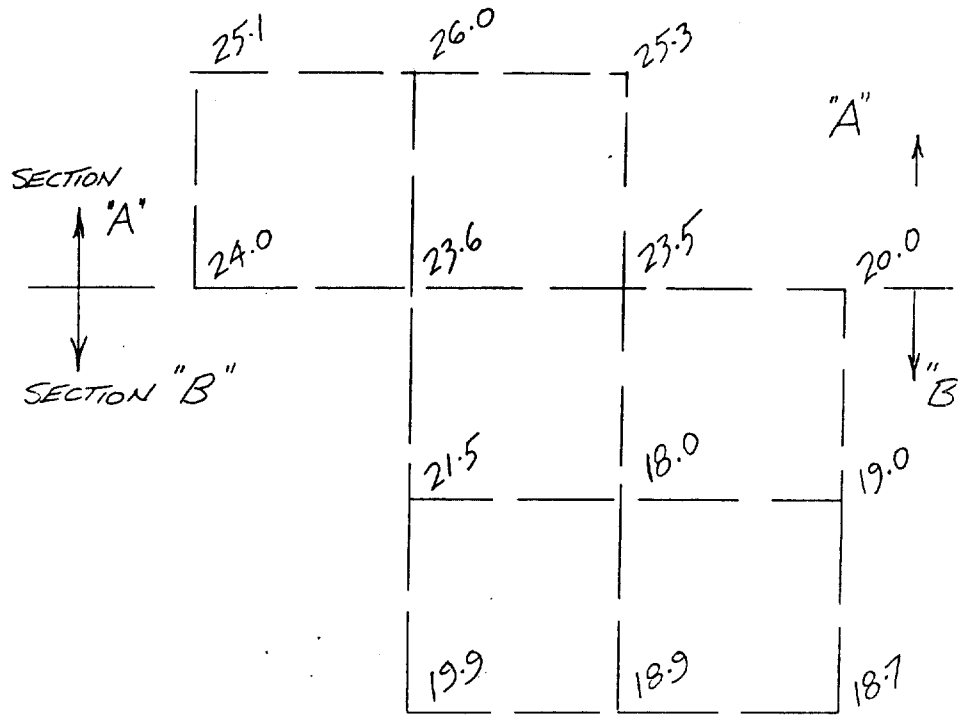
P.T.O.

QUESTION 5 (18 Marks)

a) (8 Marks)

The 20m x 20m grid shown below, is a plan of a proposed foundation excavation for a building. The excavation will have vertical side slopes.

The excavation is to be made to R.L. 23.0m in section A and R.L. 20.0 in section B. Calculate the volume of material to be removed from each section and the total volume for the site.



Volume to be removed from Section "A".....

Volume to be removed from Section "B".....

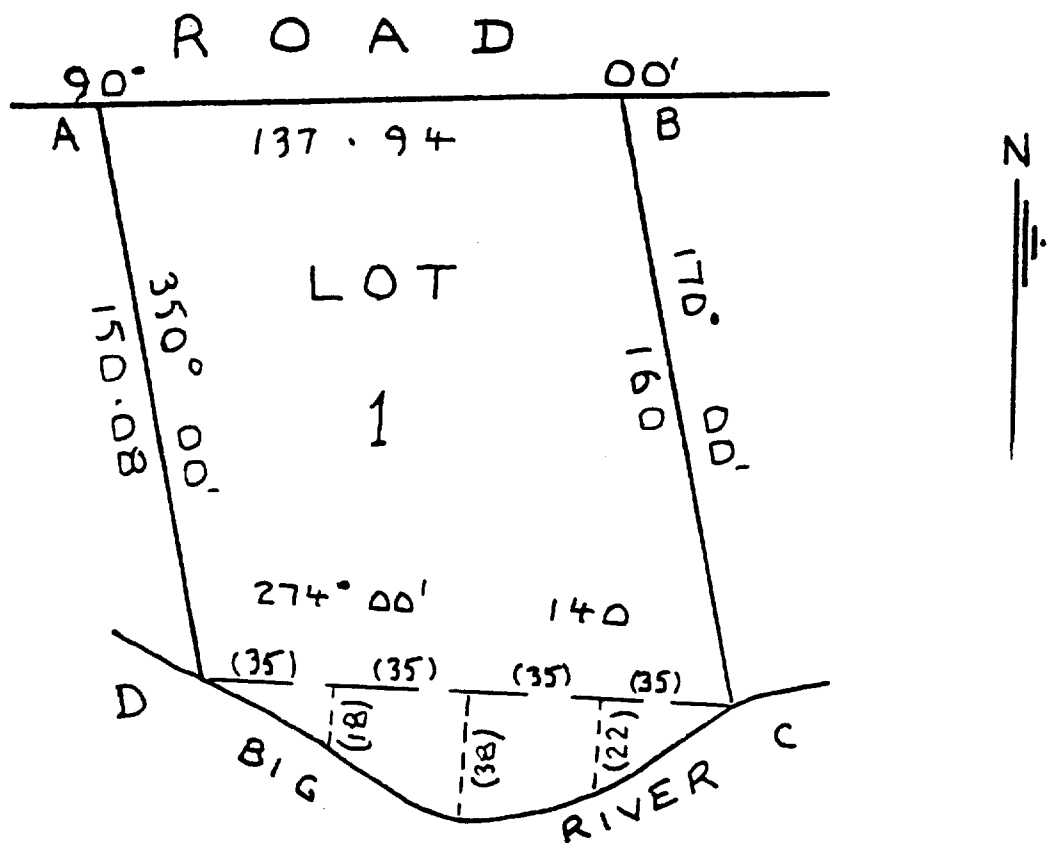
Total Volume to be removed from site:.....

P.T.O.

b) (10 Marks)

The plan below shows a block of land, which is bounded on three sides by straight lines and on the fourth side by a river. A traverse line was run adjacent to the river bank and offsets measured from the line to the bank.

Calculate the total area of the block of land by firstly calculating the area within boundaries and the traverse line, then the area between the traverse line and the river bank.



Area within the boundaries and the traverse line .....

Offset area .....

Total Area .....

P.T.O.

QUESTION 6 (11 Marks)

a) (2 Marks)

You are asked to undertake a detail and contour survey with a contour interval of 0.5m. Explain where spot heights should be taken to ensure that the contours are accurately drawn.

b) (3 Marks)

List and in about one sentence explain, three advantages that come to a Surveyor from using a Total Station instrument to undertake a detail and contour survey, when compared to the stadia method with theodolite and staff. You may include office procedures as well as field work.

c) (3 Marks)
Modern total stations have the capability to run in a "robotic" mode. Give one advantage and one disadvantage of such a system.

d) (3 Marks)
A highway relocation is being planned. Briefly explain the advantages that the use of the Global Positioning System (GPS) would provide in setting up a control traverse.

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

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

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

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

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

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

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

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

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

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

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

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

$RL_S = RL_T + HI + V - m$

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

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

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

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

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

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

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

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

$Chord = 2R\sin\delta$

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

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

$Area = \pi R^2$

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

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

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

$V = \frac{w}{3}\left\{A_1 + A_n + 4(\Sigma A_{even}) + 2(\Sigma A_{odd})\right\}$

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