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: _____

AUTUMN SEMESTER, 2007

SUBJECT NAME: SURVEYING

SUBJECT NO.: 48320

DAY/DATE: FRIDAY 15 JUNE 2007

TIME ALLOWED: TWO Hours plus TEN Mins reading time

START/END TIME: 9:30 pm - 11:10 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 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 (20 Marks)

A triangular closed traverse was run at Victoria Park from point A to B and C then closing to A, as indicated on the sketch below showing bearings and distances.

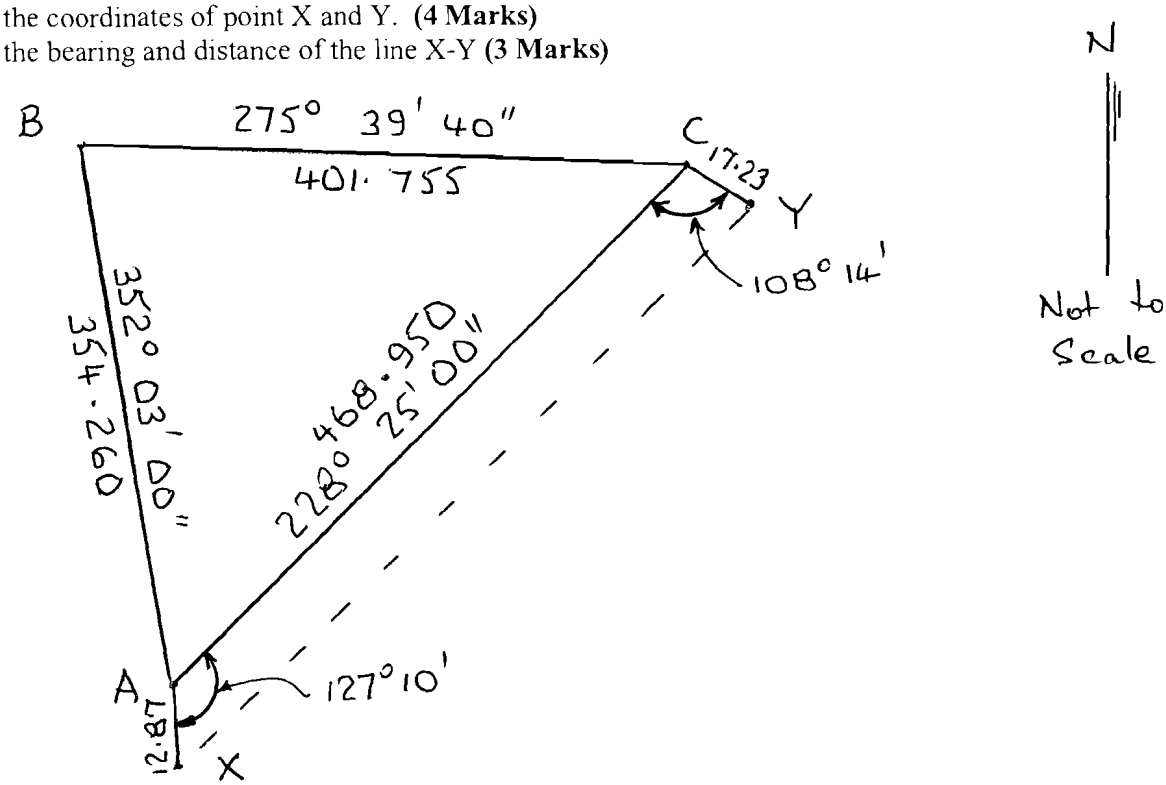
At each of points A and C, a radiation was made. The sketch below shows the horizontal angles and distances to the radiated points.

Compute the traverse misclose and the proportional accuracy of the traverse. **(7 Marks)**

Without making any adjustments, calculate the coordinates of each traverse point. **(6 Marks)**

Calculate the coordinates of point X and Y. **(4 Marks)**

Calculate the bearing and distance of the line X-Y **(3 Marks)**



LINE	Adjusted Bearing	Horiz. Dist	Δ E		Δ N		CO-ORD INATES		PT.
			E (+)	W (-)	N (+)	S(-)	E	N	
							250.000	351.000	A
A-B									B
B-C									C
C-A									A
							250.000	351.000	A
A-X									X
									C
C-Y									Y
X-Y									

Traverse Linear Misclose ..... Proportional Accuracy .....

Show coordinates of B, C, X and Y in the traverse table. (Please do all calculations to 3 Decimal Places)

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

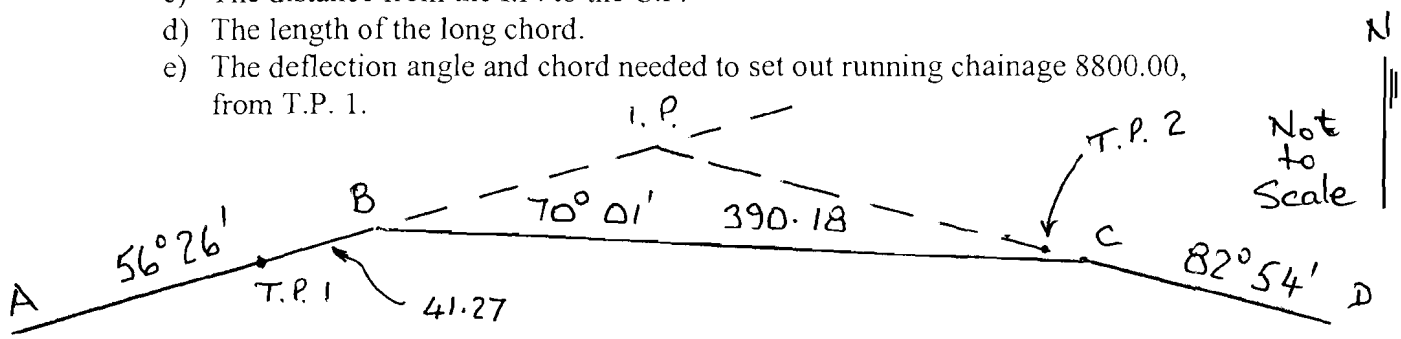
P.T.O.

QUESTION 2 (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. 1) must be located 41.270m 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. 1.



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.

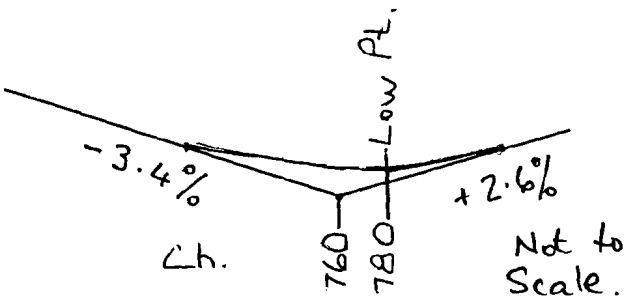
QUESTION 3 (17 Marks)

A vertical curve is to be designed on a road, to join a falling grade of 3.4 % to a rising grade of 2.6%. The Low Point on the curve MUST OCCUR at chainage 780.00. the Intersection Point is fixed at chainage 760.0m and an R.L. of 54.500m.

a) Calculate the EXACT length of the vertical curve to meet the above requirements. **(7 Marks).** Round your answer to the nearest metre, for the further calculations.
If you can not find the length asked for in part a), please adopt 280m and continue.

b) Calculate the chainages 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 BOTH T.P.s. **(8 Marks)**



CHAINAGE	GRADE	GRADE LEVEL	ORDINATE	DESIGN R.L.
T.P.1				
690.0				
I.P. 760.0		54.500		
770.0				
790.0				
T.P.2				

ANSWERS

a) Exact length of vertical curve .....

b) Enter chainages of T.P.1 and T.P. 2 into the table.

c) Complete other values in the table.

P.T.O.

QUESTION 4 (8 Marks)

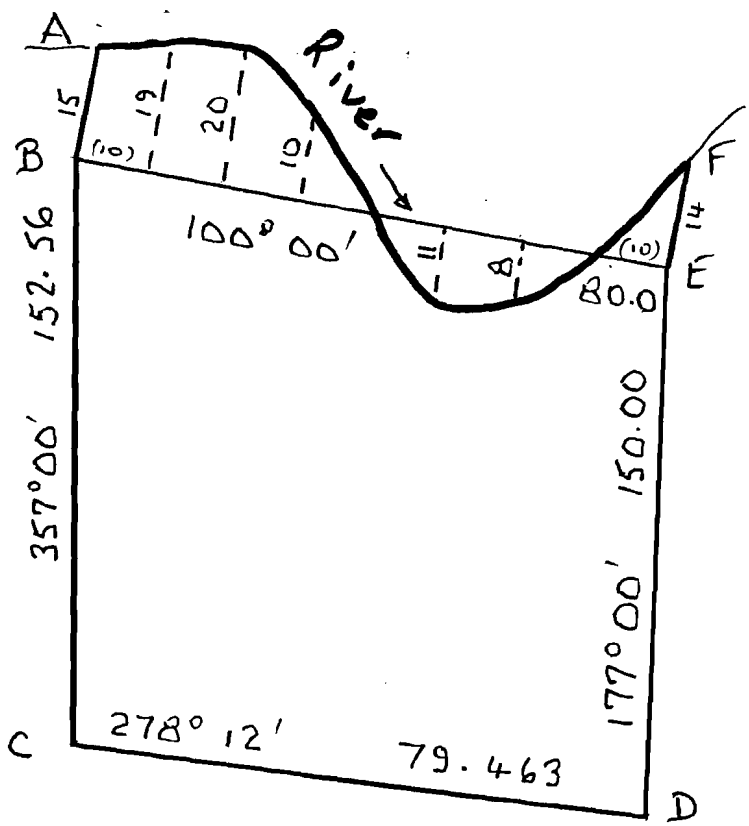
Lot 1 in the sketch plan below is bounded by straight lines connecting points A, B, C, D, E and F and then the river bank as shown by the thick line. The area of the block has to be found.

To do this a survey line was run from B to E as shown and offsets measured from the line BE to the river bank every 10m.

Determine the total area of Lot 1 by calculating

a) the area within the regular shape comprised of the straight lines connecting B C D E, then

b) use the trapezoidal rule for the offset area between the line BE and the river bank.



Area inside Shape BCDE .....

Area with Lot 1 between the line BE and the river bank .....

Total Area of Lot 1 .....

P.T.O.

QUESTION 5 (9 Marks)

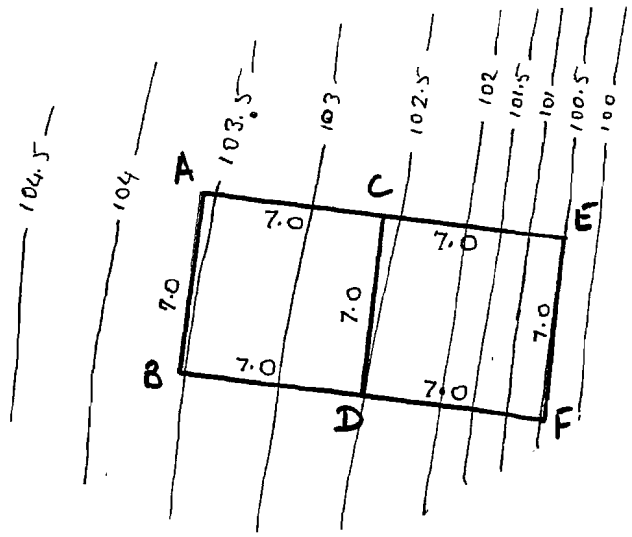
The plan below shows a contour plan of an engineering site. The rectangular area (14m x 7m) shown by A, B, C, D, E and F is to be filled to an R.L. of 103.7 so that a horizontal concrete slab can be poured. The dimensions of the slab will be 14m by 7m.

Use the contour plan to estimate the R.L.s of the natural surface at each of the six points labelled on the plan. Show your answer to ONE DECIMAL PLACE ONLY. Enter them in the table below.

At each point, calculate the height of fill needed and then use those numbers to calculate the volume of fill needed at the site. **(5 Marks)**

Is there a way that the precision of the quantity of fill calculated could be improved? Briefly state or sketch, on or adjacent to the plan, how. **(2 Marks)**

Calculate how much concrete will need to be ordered if the slab is to be 175mm thick. **(2 Marks)**



Point	Natural Surface R.L.	Top of Fill	Height		
A		103.7			
B		103.7			
C		103.7			
D		103.7			
E		103.7			
F		103.7			

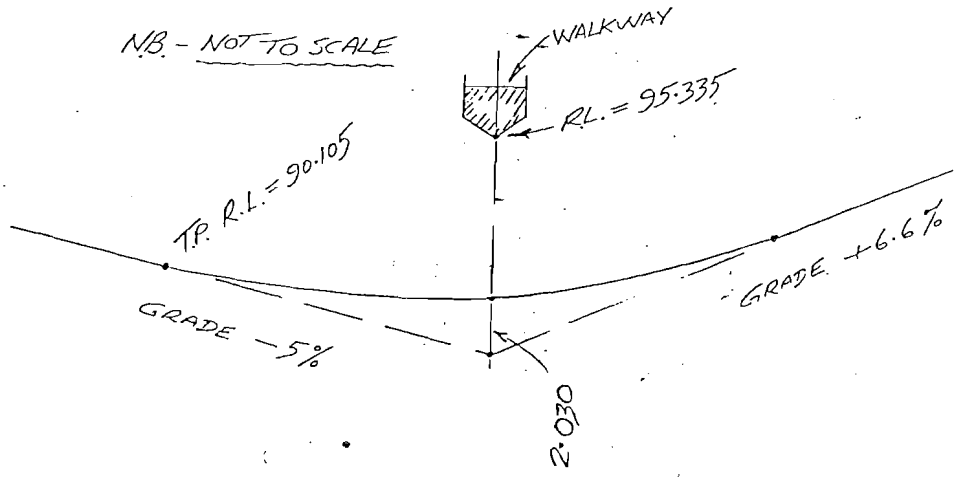
Volume of Fill needed .....

Amount of Concrete needed .....

P.T.O.

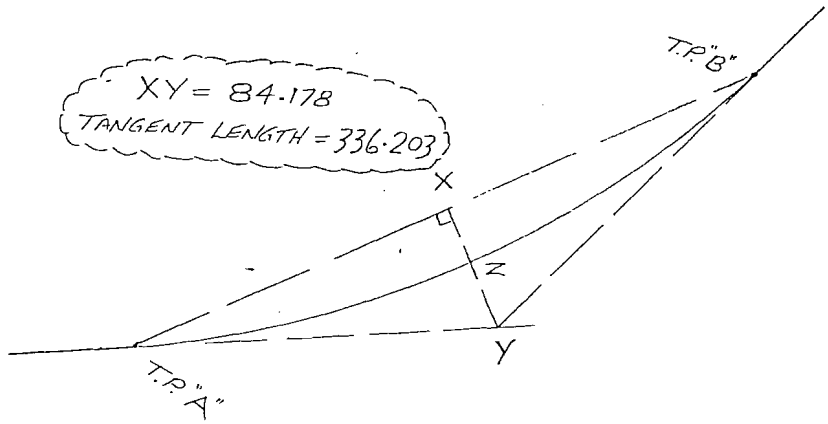
QUESTION 6 (11 Marks)

a) (6 Marks) Given the long section below, calculate the length of vertical curve needed and clearance between the road surface and the underside of the walk way which is directly above the I.P. of the grades.



Length of vertical curve (3 Marks) ..... Clearance (3 Marks) .....

b) (5 Marks) Calculate the radius of the horizontal curve and the length ZY, in the sketch below, given the data shown.



RADIUS (3 Marks) ..... Distance ZY (2 Marks) .....

P.T.O.

QUESTION 7 (15 Marks – all parts of equal value)

a) Briefly describe what an Identification Survey is. Include in your description the purpose of the survey and what items are addressed in the report.

b) What is an Easement? List at least three types of Easements.

c) What is a Cadastral Survey? By law, who are permitted to carry our Cadastral Surveys? List three examples of Cadastral Surveys.

d) What advantages would be gained by using a Total Station Instrument to carry out a contour survey have over carrying out the survey using conventional surveying methods?

e) On an inner city construction site, at what stages of the development would you need to engage a Registered Surveyor?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$Area = \pi R^2$$

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

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

$$2 \times A_{na} = \left(N_1 E_2 + N_2 E_3 + \cdots N_N E_1\right) - \left(E_1 N_2 + E_2 N_3 + \cdots E_N N_1\right)$$

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

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