THE OPEN UNIVERSITY OF SRI LANKA

Bachelor of Technology – Level 3

CEX 3233 – Surveying 1

Final Examination – 2014/2015

Time Allowed 3 hours

Date: 05th August 2015	Time 9.30 a.m. – 12.30 p.m.

Answer any **five** questions

Q1. i). Define the following terms used in levelling.

  a). BS, b) FS, c) IS, d) TBM and e) Reduced level   (5 Marks)

ii). Table 1 shows readings recorded by a student who has carried out levelling survey for drawing the longitudinal section of a 50 m road section. The readings were recorded in the order of taking readings.

Point	TBM 1	0 m	0 m	10 m	20 m	20 m	30 m	30 m	40 m
Staff Reading (m)	2.150	1.650	1.645	2.345	1.965	1.425	1.925	2.050	2.135

50 m	TBM 2
2.525	2.340

  Table 1

a). Rerecord these readings on a standard record sheet used for levelling.   (3 Marks)

b). Using a suitable method calculate the reduced levels of each point. Reduced level of TBM 1 is given as 100 m.   (6 Marks)

c). The total error of the survey is calculated as (– 0. 035 m). Calculate the reduced level of TBM 2.   (2 Marks)

d). If the allowable error is (+ or – 0.05 m) distribute the total error and find the corrected reduced levels.   (4 Marks)

Q2. i) With suitable sketches explain the difference between a closed traverse and an open traverse.   (2 Marks)

ii) Explain the method used to find the angular error of a closed traverse and how this error can be distributed if the angular error is in the permissible range.   (1 Mark)

iii). Table 2.1 shows details of closed traverse ABCDA. (Points are marked in
    - anticlockwise direction.)

Angle	Corrected Value	Side	Measured Length (m)
DAB	$97^0\,41'\,15''$	AB	22.11
ABC	$99^0\,53'\,45''$	BC	58.34
BCD	$72^0\,24'\,30''$	CD	39.97
CDA	$90^0\,00'\,30''$	DA	52.10

Table 2.1

a). The whole circle bearing of line BC is given as $125^0\,30'\,30''$. Calculate the Whole Circle bearings of the other three lines. (6 Marks)

b). Calculate the Latitude and Departure of each line and hence find the total linear error of the traverse. (8 Marks)

c). If the scale of the drawing is 1 : 500 and the minimum observable length on the paper is 1mm, check whether the error is within the permissible length. (3 Marks)

Q3). i) Explain the criteria to be used to select the points as survey stations in chain surveying. (3 Marks)

ii). Explain the importance of tie measurements taken for Survey stations in chain surveying. (3 Marks)

iii). Explain the difference between offsets and oblique measurements by indicating their uses on the field. (4 Marks)

iv). A pond of nearly 75 m diameter is obstructing the chain line. Explain with a suitable diagram how this obstruction can be overcome. (5 Marks)

v). Figure 3 shows the readings taken to overcome obstruction due to a river across the chain line, where angles generated at P2 and P1 are 90^0 each. The measured lengths are given as P1P2 = 13.6 m, P1P4 = 12.3 m and P2P5 = 11.2 m. Calculate the length P2P3 across the river. (5 Marks)
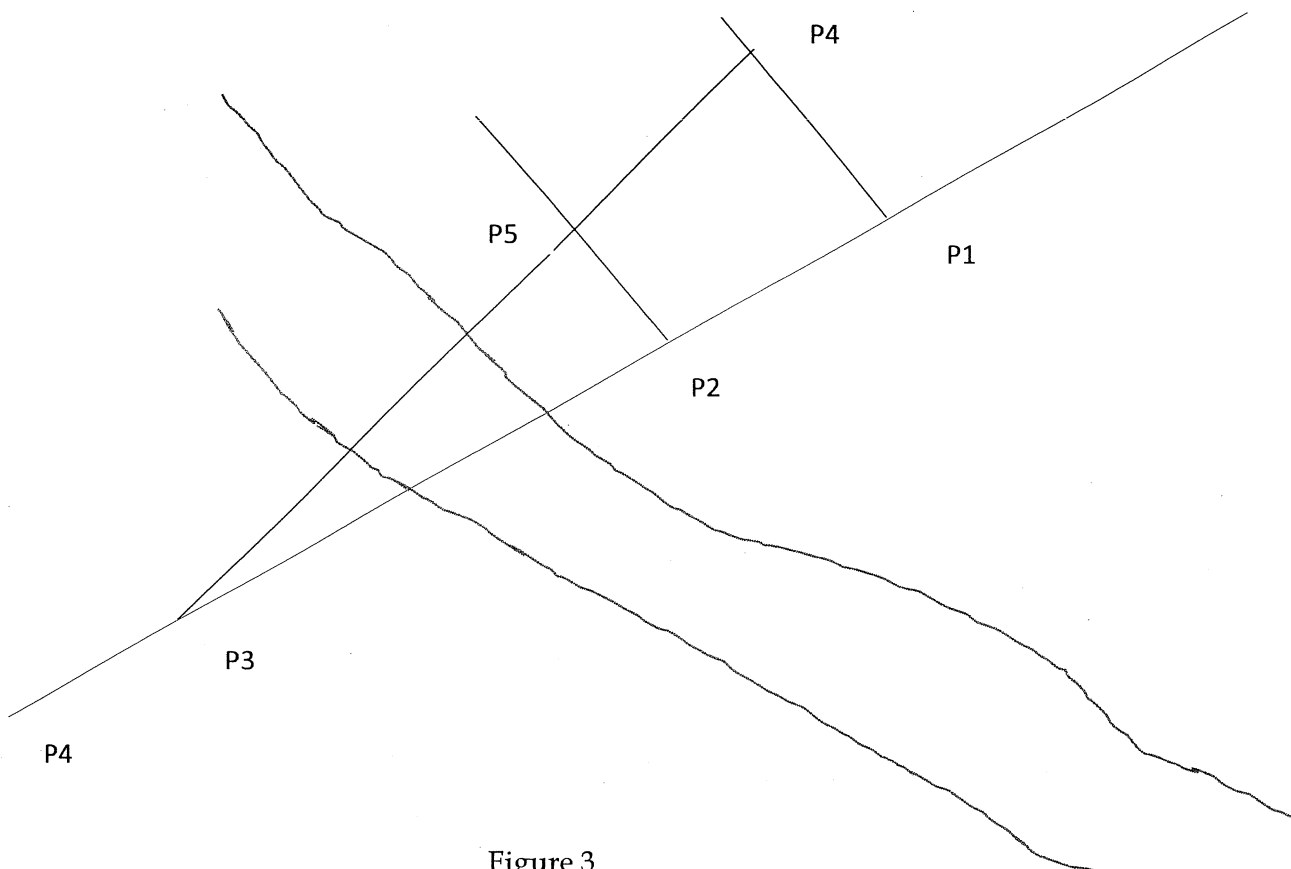
Figure 3

Q4. i). Briefly explain a method used to calculate the area of a surface with irregular
boundaries. (4 Marks)

ii). The coordinates of 4 survey stations are given in Table 4.1.

Survey Stations	North Coordinate (m)	East Coordinate (m)
A	100	100
B	80	120
C	20	60
D	60	100

Table 4.1.

a). Draw this traverse on a graph sheet using a suitable proper scale. (3 Marks)

b). Calculate the total area enclosed in the traverse using a suitable proper method.
(5 Marks)

iii). Figure 4.1 shows a cross section of an existing road and the proposed road. Find the
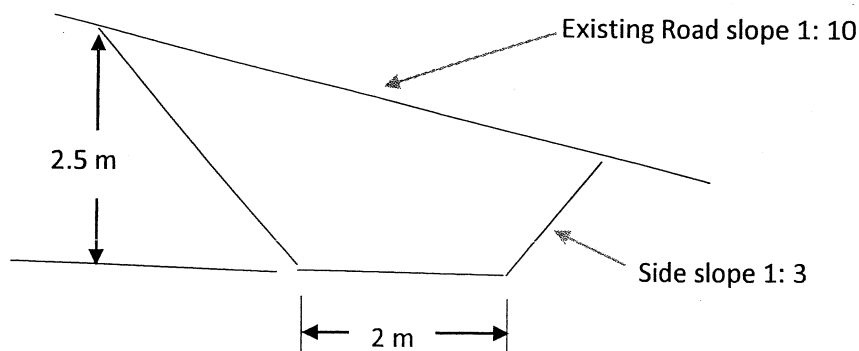cutting area of the section. (8 Marks)

Existing Road slope 1: 10

2.5 m

Side slope 1: 3

2 m

Figure 4.1

Q5. i). Explain a method that can be used to find the volume of the reservoir.   (5 Marks)

ii). The Table 5.1 shows the cut areas and fill areas of the newly proposed road with respect to the distances measured from 0 m.

Distance (m)	0	50	100	150	200	250	300
Cut area (m^2)	28.40	23.82	18.44	16.90	17.64	16.55	15.33
Fill area (m^2)	0	0	0	4.08	9.27	11.30	11.54
Distance (m)	350	400	450	500	550	600	
Cut area (m^2)	12.85	10.02	4.60	0	0	0	
Fill area (m^2)	12.25	15.22	15.97	19.75	21.17	25.36	

Table 5.1

a). Calculate total cutting volume and filling volume separately using end area method of area calculation.   (10 Marks)

b). What do you understand by the term Prismoidal Correction used in volume calculation. Correct the total volume calculated in part a using Prismoidal Correction.   (5 marks)

The prismoidal formula

$$V = (x/3).[A_0 + 4A_1 + 2A_2 + 4A_3 + 2A_4 + \ldots + 2A_{n-2} + 4A_{n-1} + A_n]$$

Q6. i) Define the term contour line and explain why two contour lines cannot cross or meet each other   (3 Marks)

ii). Briefly explain the direct method used in contouring.   (4 Marks)

iii). Figure 6 is shown a part of a contour map. Draw the cross section along a line PQRSTU. (No need to draw to a scale).   (3 Marks)
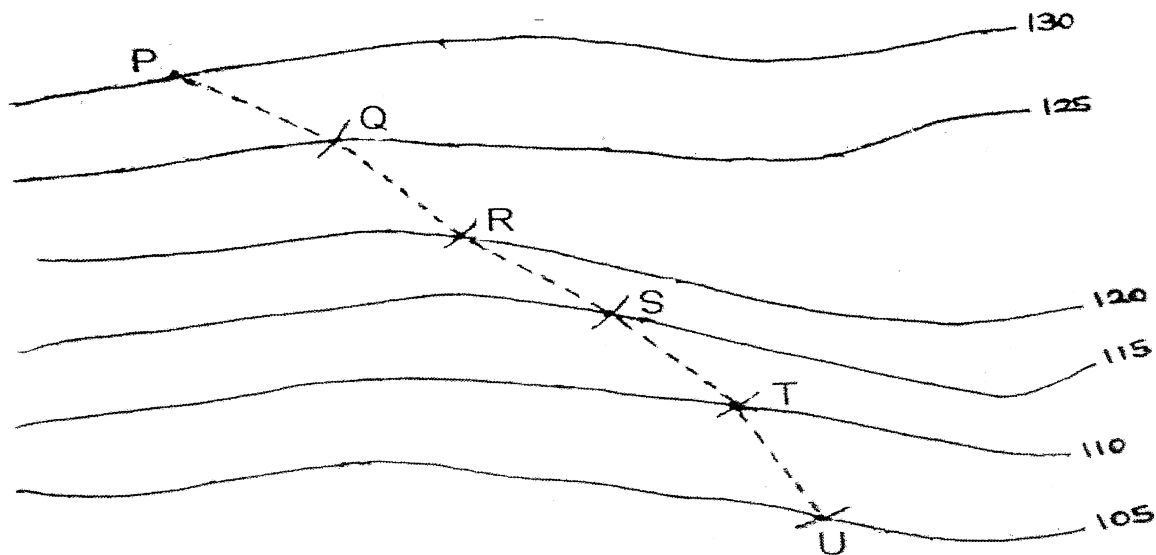
Figure 6

iv). The readings given below were made with a tacheometric theodolite having a multiplying constant, K of 100 and no additive constant. The reduced level of station A was 100 m and the height of the instrument axis is 1.35 m above the ground. Calculate the gradient of line BC.　　　　　　　　　　　　　　　(10 Marks)

Station	To	WCB	Vertical Angle	Stadia Readings (m)
A	B	$48^0\,00'$	$+11^0\,30'$	2.048/ 1.524 / 1.000
	C	$138^0 00'$	$-17^0\,00'$	2.112 / 1.356 / 0.600

Take　　　$H = K\,S\,\cos^2\theta$　　　$V = (1/2)\,KS\,\sin 2\,\theta$

Q7). i). Discuss two advantages and two disadvantages of plane table surveying respect to other conventional surveying methods.　　　　　　　　　　(4 Marks)

ii). One of the basic concepts of engineering surveying is working from whole to the part but not working from part to the whole. Explain this with suitable examples.

(4 Marks)

iii). List five different errors found in chain surveying. Categorize them according to the main types. Clearly explain the reasons for your categorization.　　　(4 Marks)

iv). Clearly explain the method of finding the reduced level of soffit level of second floor slab with respect to given TBM.　　　　　　　　　　(4 Marks)

v). Explain a method that can be used to find the volume of a sand pile using surveying knowledge　　　　　　　　　　　　　　　　　(4 Marks)