The Open University of Sri Lanka
Faculty of Engineering Technology

081

Study Programmes	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX 4342 – Surveying I**
Academic Year	: 2021/2022
Date	: 21st February 2023
Time	: 09.30-12.30hrs
Duration	: **3 hours**

1. This question paper consists **of Seven (07)** questions in **Seven(07)** pages.
2. Answer **for any five(05) questions.**
3. Answer for each question should commence from a new page.
4. This is a Closed Book Test (CBT).
5. Answers should be in clear hand writing.
6. Do not use Red colour pen.
7. Any assumptions that you will be making (if any) during calaculations shall be clearly stated.

Question 1

1. What is the main assumption made in a **Plane survey**?

(03 marks)

2. a) State main factors that are affecting for a selection of scale for a plan

(02 marks)

b) Discribe the possibility of plotting a plan of a **square land of 15perches** in a A4 paper to a sacle of 1:100. You need to provide necessary calculations and jusifictions for your judgement.

(02 marks)

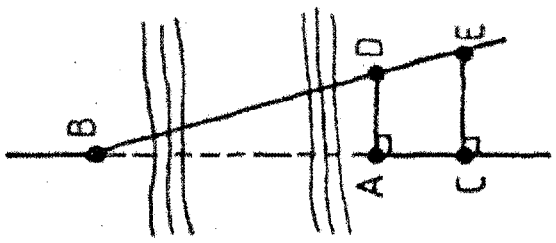
3. Steel tape having a nominal length 30m has been used for measuring a chain line. Measuring has been carried out by four (04) spans of 29.695m , 29.900m, 29.885m and 22.653m. The measuring has been carried out at the same temperature at which tape was standardized. The standard recommend pull for this tape is 15kg and last three readings were taken under standard pulling force. But, first reading was taken under a pull of 22kg. further, it has found that the exact length of the tape under standard pull and temperature is 30.022m. Calculate the actual chain length with necessary corrections. The cross sectional area of the tape is $3.06mm^2$ and E value of tape material is $15300kg/mm^2$.

(07 marks)

4. Figure Q1 shows a technique used to obtain distance AB across a river where it can not directly measure distance by spanning a tape.

Distances of AD,CE and DE are 10.235m, 12.820m and 8.173m respectively. Calculat the length AB.

Draw a sketch of another measuring technique that can be used to obtain distance AB with an ordinary tape.



(06 marks)

Figure Q1

Question 2

1. (a) Table 1 shows recorded levelling sheet. Calculate reduce levels for all stations using a standard method. All stations shall be presented in a format of standard table with all possible checks. Redue level of the station "O" is 200.000m.
(10 marks)

Table 1

Backsight	Inter sight	Foresight	Station
2.785			O
	1.855		P
	1.325		Q
	1.675		R
1.555		3.254	S(Change Point)
		2.225	T

(b) If the station T is a Bench Mark and redue level of " T" is 198.750m, Calculate the error of redue level at T. (02 marks)

(c) Briefly discuss three (03) possible errors that has contributed for the error calculated in (b). (03 marks)

2.To obtain a reduce level of a soffit of a slab, staff was held at an **inverted** position. The recorded level staff reading with this inverted position is 2.135m. The staff reading obtained while keeping the staff on a Bench mark(non-inverted) having a reduced level of 60.000m (from same instrument station point and with same instrument height) was 3.120m. Calutate reduce level of the sofit of the slab.
(05 marks)

Question 3

1. Table 2 shows observed included angle readings for a closed traverse.Copy down the given table and complete it to obtain WCB of all lines. The WCB of line KL is 65.3375^0. Calculate the WCB of all the arms after distributing the errors. (08 marks)

Table 2

station	Line	Observed included angle			Corrected included angle			Corrected included angle (in degrees)	WBC (in degrees)
		DEG	MIN	SEC	DEG	MIN	SEC		
K		95	9	45					
	KL								65.3375
L		123	12	0					
	LM								
M		30	10	0					
	MN								
N		113	7	15					
	NK								

2. Table 3 shows a part of table developed to calculate coordinates of a traverse. Corrected WCBs (after making angular correction) are provided and you are required to calculate the cooridnates at points Y and Z of the traverse by completing the table 3 in your answer paper . The coordinates of X can be taken as (1000.00, 1000.00). To obtain corrected coordinates, adjustment of coordinates can be performed using Bowditch's method. (12 marks)

Table 3

	Travserse legs	length (m)	Corrected WCB	Lattitude		Departure		Corr. Lattitude		Corr.Departure		Coordinates	
				North	South	East	West	North	South	East	West	N	E
X												**1000.00**	**1000.00**
	XY	55.270	**68 15' 45"**										
Y													
	YZ	116.050	**192 45' 45"**										
Z													
	ZX	95.875	**344 37' 15"**										
X													

Question 4

1. Briefly explain the **basic principal of stadia tacheometry** by drawing a diagram and developing the basic equations. (05 marks)

2. Tachemetry technique has been used to obtain horizontal distance and level difference between two laoctaion P and Q in a hilly area. The instrument station is O when obtaining the readings. Staff was at vertical positions while taking the readings. Observations are tabulated below in Table 4;

Table 4

Staff Station	Inst. station	Horizontal circle	Vertical circle	Stadia readings (m)		
P	O	$35^0\ 30'$	$-8^0\ 30'$	2.015	1.555	1.095
Q	O	$82^0\ 00'$	$+5^0\ 00'$	1.810	1.290	0.770

Calculate level difference and distance between P and Q.

The instrument constants for the instrument are 100 and 0. (10 marks)

3. Briefly discuss the influence of staff tilt to the accuracy of computed distance in stadia tacheometry. State the recomnded limiting values of inclination and length of sight to maintain an acceptable accuracy. (05 marks)

Question 5

1.

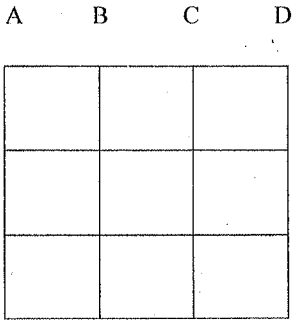


Figure Q5

Figure Q5 shows a 24m x 24m land and it has been divided to 8m x 8m squares as shown in the figure. This land has to be eleveated to a formation level of 20.5m (the level will be same in the entire plot of land when the filling will be completed). Existing levels of the corners of squres are as follows;

A1 - 15.25m B1 - 14.72m C1 - 14.28m D1 - 14.05m
A2 - 15.35m B2 - 14.35m C2 - 15.07m D2 - 14.36m
A3 - 14.85m B3 - 15.12m C3 - 15.42m D3 - 14.75m
A4 - 14.63m B4 - 15.38m C4 - 15.63m D4 - 14.82m
It is assumed that sides of the flling is vertical.

a) Calculate the fill volume by using **square prism** technique. (06 marks)

b) Present a methematical technique that can be used to improve the accuracy of volume using same level readings. (02 marks)

c) Calculate the volume of prism bounded by A1 B1 B2 A2 using square prism technique and the techqiue presented in part b) and find the difference between two answers. (04 marks)

2. a) Areas measured within the contour lines of a plan of a reservoir site is as follows;

Contour level (m)	Area (mm2)
55m	12300
60m	15070
65m	21200
70m	24725
75m	28970
80m	34575
85m	39350

These areas has been measured using a planimeter from a plan drawn to a scale of 1: 1000. The lowset draw off level is 55m and maximum top water level is 85m. Calculate the full storage capacity of this reservoir. (05 marks)

b) Name contour lines between which water level will exist,when revsior is at 75% of the full storage capacity. (03 marks)

Question 6

1. Measured area of a plan using a planimeter is 108.32cm^2. The scale of the plan is 1:200. Calculate the actual land extent of the land , which is presented by this plan in preches?

(04 marks)

2. Describe the difference between Simpson's rule and the trapizoial rule that are used for area calculation using sketch. (03 marks)

3. Offsets (perpendicular distances) were taken at 5m ineterval to a boundary fence from a chain line in a chian survey. The offset measurements that were obtained are 1.58m, 2.22m, 3.24m, 4.51m, 3.34m,1.78m, 0 m. Calulate the area bounded by fence and the chain line using Simpson's rule. (05 marks)

4. Figure Q6 shows a cross section of a proposed road section in cutting. Formation width of the road is 6.5m and center height is 2.3m. it can be assumed that the formation of the road is horizontal. The existing ground slope of the section is 1:15 and side slopes of road section formation for both sides is 1:2. Calculate the area of cutting (ACBED).

(08 marks)

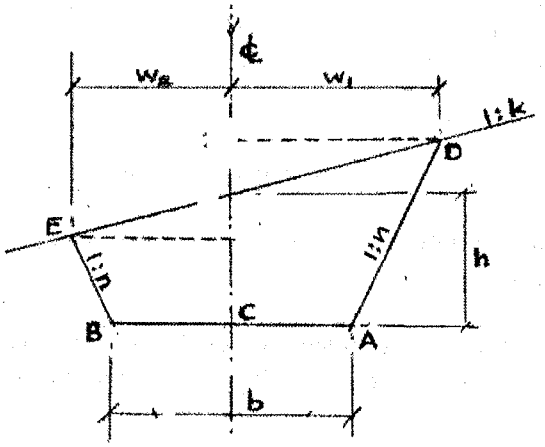


Figure Q6

Question 7

1. Briefly describe reasons for "working from whole to part" in most surveying exersices.

(03 marks)

2. State main types of errors in surveying and describe one of them. (04 marks)

3. Briefly describe the detection and elimination of local attraction effects in compass traversing. (04 marks)

4. A survey instrument has a vernier scale relevant to angular measurement. Length of 60 divisions of Vernier scale is equal to the length of 59 divisions in the main scale. A division of main scale represent 30" (0.50). When an angle was measured, the starting point of vernier scale was located between 128^0 30" and 129^0 00'' and 34^{th} division of the vernier scale exactly coincides with a division in the main scale. What is the final reading of this angular measurement? (04 marks)

5. Level readings of two points (P and Q) along a radial line used in Spot height method for contouring having levels of 54.235m and 56.180m respectively. Horizontal distance between P and Q is 6.53m. Calculate the distance along radial line to the intersecting point of this radial line and the contour of 55m from point P. (05 marks)