00103

The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programmes	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX4342 Surveying I**
Academic Year	: 2020/2021
Date	: 30th January 2022
Time	: 1400-1700hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists **Seven (7)** questions in **Five (5)** pages.
3. Answer **Any Five (5) Questions.**
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test (CBT).
7. Answers should be in clear hand writing.
8. Do not use Red colour pen.

QUESTION 1

(a) Briefly explain two reasons for length corrections in band tape for band tape measurements. (4 marks)

(b) Length of a base was measured using a 30m steel band, which was suspended above the ground, not touching any obstacles in the ground using three spans as shown in the Table 1. The measured length and the slope of the line joining the two end supports of the tape are as follows,

Table 1

	Span 1	**Span 2**	**Span 3**
Measured length/ (m)	29.775	25.565	27.220
Slope	2^0 55'	Level ground	3^0 15'

The standard pull of 100N was applied on the field for the span 2. For spans 1 and 3, the force applied was 140N as to prevent from touching the obstacles. The field temperature was 30^0c while the measurement was being carried out. Find the true length of the base.

Following properties of the steel band tape is given.

Mass = 0.0232 kg/m
Cross sectional area = 2.30 mm^2
Elastic modulus = 200GPa
Coefficient of linear expansion = $1.15x10^{-6}$ Per ^{0}C
Standard temperature = 20^0c (16 marks)

QUESTION 2

The internal angles of a closed traverse PQRS (named in an anti-clockwise direction) have been measured with an optical theodolite, and found to be as follows,

P = 84^0 24'20", Q = 75^0 5'45", R = 95^0 25'10", S = 105^0 05'10"

(a) Distribute any errors involved with internal angles and adjust them within acceptable limits. (5 marks)

(b) Determine the reduced bearings of the sides of the traverse if the line PQ runs in **Easterly** direction. (5 marks)

(c) Prepare a traverse sheet if the corrected lengths of sides PQ, QR, RS and SP are 34.45m, 45.68m, 55.56m and 45.34m respectively. Assume the coordinates of Point P as 200mN, 200mE. (10 marks)

QUESTION 3

A distributing canal is divided in to the two field canals which are diverted from a single point. A chain line has been laid starting from the divergent point in between these two canals for a distance of 50 m. Offsets have been taken to the left and right from the chain line to both canals 1 and 2 are tabulated in Table 2.

(a) Using Simpson's rule, estimate the area in between two field canals up to a 50m, along the chain line (10 marks)

Table 2

Chainage/(m)	10	20	30	40	50
Offset to the canal 1/ (m)	8.0	9.0	7.0	5.0	5.0
Offset to the canal 2/(m)	5.0	7.0	10.0	6.0	5.0

(b) In the above example, the bed slope of one canal is to be maintained at a gradient of 1%. The following Table 3 shows the elevation of ground levels along the center line of the canal. Assume the cross section of the existing ground of the canal does not change laterally at the measured points, calculate the amount of the earth excavation. The bottom elevation of the canal at the point of divergence is 100m. You can consider the width of the canal as 1m. (10 marks)

Table 3

Distance along the canal/ (m)	0	10	20	30	40	50	60
Elevation/(m)	103.0	107.0	106.0	105.0	104.0	103.5	102.0

QUESTION 4

(a) The Figure 1 shows the contour plot of a river valley.

(i) What is the most suitable location to construct a bridge across the valley? Justify your answer.

(ii) Draw the appropriate contour plan after constructing the bridge at your selected location (5 marks)

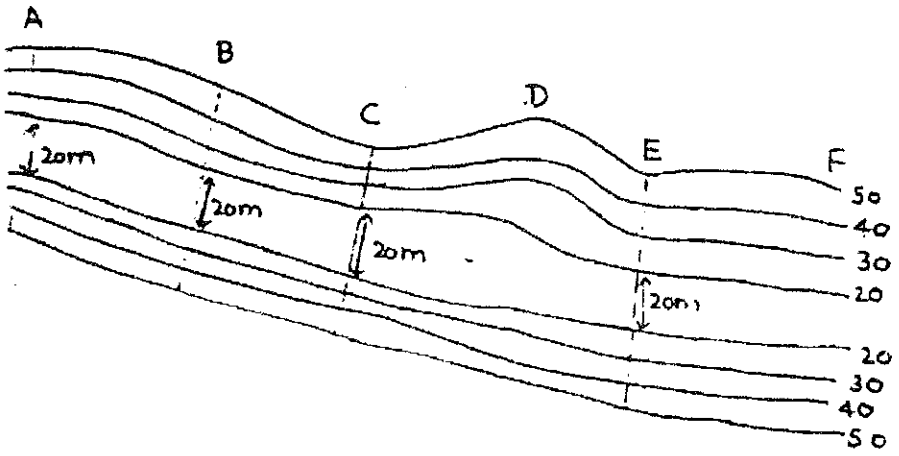

Figure 1

(b) In order to determine the triangular area within three points located on a inclined ground, tachometric observations have been made. Table 4 shows these readings. Determine the area within three points P, Q and S. (15 marks)

Table 4

Name of the station	P	Q	S
Reduced level / (m)	64.2	64.2	64.2
Coordinates of the station	40.7N, 51.60E	40.7N, 51.60E	40.7N, 51.60E
Instrument Height / (m)	1.52	1.52	1.52
WCB	$42^0 30'$	$85^0 00'$	$62^0 00'$
Vertical circle bearing	$+16^0 00'$	$+12^0 20'$	$+14^0 40'$
Stadia reading /(m)	0.82, 1.06, 1.3	1.06, 1.915, 2.23	1.4, 1.75, 2.13

QUESTION 5

(a) Discuss the difference between Dumpy level and Tilting level. (3 marks)

(b) Table 5 shows the set of staff readings recorded by a student who has carried out levelling survey to prepare a longitudinal section of an 80m road section. The readings were recorded in the order of taken readings.

Table 5

Point/ Chainage/(m)	TBM1	0.000m	0.000m	10.000m	20.000	30.000	30.000	40.000
Staff Reading /(m)	3.450	2.250	2.550	1.455	1.235	0.755	0.955	1.555
Point/ Chainage/(m)	50.000	50.000	60.000	60.000	70.000	70.000	80.000	TBM2
Staff Reading /(m)	2.555	2.875	2.955	3.125	3.330	3.450	3.500	3.555

(i) Book the above readings in standard record sheet used for levelling. (5 marks)

(ii) Using "**Height of Collimation Method**", determine the reduced levels of each TBM and chainage points along the road section. You can assume the reduced level of TBM1 as 200m. (9 marks)

(iii) Briefly explain the procedure that you have to perform to check the levelling accuracy of sections. (3 marks)

QUESTION 6

Write short notes on following topics

(a) The difference between "**Rise and Fall Method**" and "**Height of Collimation Method**". (5 marks)

(b) The three types of errors that are found in surveying (5 marks)

(c) Open traverse survey and closed traverse survey (5 marks)

(d) Importance of Reconnaissance surveying before starting surveying activities. (5 marks)

QUESTION 7

(a) Draw a sketch of an optical theodolite and mark all parts. (5 marks)

(b) Briefly explain the procedure of levelling of an optical theodolite (5 marks)

(c) Briefly explain the procedure of measuring of Whole Circle Bearing (WCB) of a traverse survey

(5 marks)

(d) Briefly explain the importance of Temporary Bench Marks (TBM) of a levelling work

(5 marks)

STN.	LINE	OBSERVED INCLUDED ANGLE	CORR. INCLUDED ANGLE	WHOLE CIRCLE BEARING	REDUCED BEARING	CARD. PTS.	LENGTH (m)	LATITUDE (m)	DEPARTURE (m)	CORR. LATITUDE (m)	CORR. DEPARTURE (m)	COORDINATES (m)	
												NORTH	EAST