TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Baishakh

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE 504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Fixing a new point at least from two control point and consistency are the most important principles in surveying works, explain with illustration. [4]

2. A rectangular plot of land of area 2.25 hectare is represented on a map of similar rectangle area of 36 cm². Calculate the representative factor of the scale of the map. Draw a scale to read up to a meter from the map. The scale should be long enough to measure up to 400m. Also draw a scale to read 275 m from the map using diagonal scale. [4]

3. Define systematic error and random error. A base line was measured by 20m tape suspended in catenary under a pull of 145 N, the mean temperature being 14°C. The lengths of various segments of the tape and the difference in level of the two ends of a segment are given in table. [2+6]

Span	Length (m)	Difference in level (m)
1	19.992	+ 0.346
2	19.930	− 0.214
3	19.892	+ 0.309
4	19.940	− 0.106

If the tape was standardized on the flat under a pull of 95 N at 18°C determine the correct length of the line. Take:

Cross-sectional area of the tape = 3.35 mm², mass of the tape = 0.025 kg/m, coefficient of linear expansion = 0.9×10^{-6} per °C, Young's modulus = 14.8×10^{4} MN/m²

4. Define meridian. Describe with example about the graphical adjustment of disclosure during plotting of compass traverse. [1+4]

5. The clockwise angles of a closed polygon are observed to be as follows: [6]

Station	A	B	C	D	E	F
Angles	223°46′	241°17′	257°02′	250°21′	242°19′	225°15′

If the true bearings of BC and CD are 123°14′ and 200°16′ respectively, and magnetic bearing of EF is 333° 21′, calculate the true bearing of all other sides and the magnetic declination.

6. The following consecutive staff readings were taken on pegs at 15m interval on a continuously sloping ground: 0.895, 1.305, 2.800, 1.960, 2.690, 1.255, 2.120, 2.825, 1.450, 1.895, 1.685, 2.050 (Stn. A). R.L. of station A where the reading 2.050 was taken is known to be 50.250 m. From the last position of the instrument two stations B and C with R.L. 50.000 m and 51.000 m respectively are to be established without disturbing the instrument. Workout the staff reading at B and C and compute the RL of all points in HI level book format. [8]

7. The results of reciprocal leveling between stations A and B 250 m apart on opposite sides of a wide river were as follows. [4]

Level at	Height of eyepiece (m)	Staff reading
A	1.399	2.518 on B
B	1.332	0.524 on A

Find (a) The true difference of level between the stations.(b) Error due to curvature and refraction, assuming the mean radius of the earth 6365 km.(c) Collimation error.

8. Why is two peg test carried out? State the points to be considered in fly leveling. [1+3]

9. What are the fundamental lines of theodolite? Write desired relation between them with necessary sketch. [1+4]

10. The following observations were recorded in a theodolite traverse ABCDA. Compute the correct horizontal angles and find missing readings from the following readings in given table. Find the permissible angular error, if least count of theodolite is 20". [8]

Inst.Stn.	Target Stn.	HCR Observations		VCR Observation	
		FL	FR	FL	FR
A	D	90°00'00"	269°59'50"	88°50'10"	?
	B	180°16'10"	00°16'10"		
B	A	90°00'10"	270°00'20"	?	308°51'20"
	C	200°25'50"	20°26'10"		
C	B	90°00'00"	269°59'40"	99° 00' 50"	?
	D	179°08'40"	359°08'30"		
D	C	89°59'50"	270°00'10"	?	270°14'20"
	A	160°12'40"	340°12'30"		

11. Calculate the area of transverse by coordinate and double meridian distance method. [4]

Line	PQ	QR	RS	SP
Latitude (m)	-390	-270	380	280
Departure (m)	320	-170	-620	470

12. Find the volume of cutting in a length of 200m with the following data for a two level section using the prismoidal and trapezoidal formula. Also calculate the prismoidal correction. Formation width 10m, side slope = 2:1, transverse slope = 5:1. The ground level at 50m intervals are given below.

Chainages (m)	0	50	100	150	200
Ground level (m)	580.50	582.00	583.60	584.25	585.40

The formation has a upward slope of 1 in 40 with the formation level at 0+000 chainage being 580.000m. [8]

13. Write short notes on: (Any Three) [3×4]

a) Principles involved in choosing stations for a chain and tape survey.
b) Plane table resection and advantages of plane table surveying.
c) Differentiates between triangulation and trilateration.
d) Classification and principles of EDM.

***

Subject: - Surveying I (CE 504) .

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Explain briefly the principles of surveying with suitable examples. [4]

2. Explain 'Scale of a Map' and how the scale has been classified and its range of values? The distance between Kathmandu and Pokhara is 200 km. In a highway map it is represented by a line 5 cm long. Find it's R.F. Draw a diagonal scale to show single km and maximum 600 km indicate the following distances. a) 224 km b) 338 km c) 459 km d) 579 km [3+5]

3. A tape of nominal length 30 m is standardized in catenary at 50N tension and found to be 29.8940 m. If the mass of the tape is 0.015 kg/m, calculate the horizontal length of a span recorded as 24 m. (Note: Calculation should be done taking at least 4 decimal) [5]

4. What is the fundamental principle of chain surveying? What are the operations involved in chain surveying? Explain with neat sketches. [4]

5. Determine the Permissible angular mis-closure and adjusted bearings in the following link traverse PABCQ. Bearing of line PA = 30°15′ and bearing of line QC = 225°45′. The deflection angle measured are $\Delta_A = +100°30′$, $\Delta_B = +135°45′$ and $\Delta_C = +140°00′$. Least count = 30′. [6]

6. In the compass surveying you corrected all the bearing then plotted to it why there is closing error? Define closing error. If the closing error direction is perfectly horizontal, then describe the graphical method with neat sketch. [4]

7. What are the principles of plane table surveying? Describe the process of Orientation of plane table by Back sighting. [4]

8. What are the basic principles of levelling and describe reciprocal levelling. [3+2]

9. Following readings were taken during a leveling work from TBM1 to TBM2; 2.191, 2.505, 2.325, 1.496, 3.019, 2.513, 2.811, 1.752 and 3.824 m. Level instrument was changing after 4th and 7th readings. Enter the above readings in a level field book format and compute RLS of all the points and adjust the RLs if error arises also. RLs of TBM1 and TBM2 are 1449.870 and 1448.710 m respectively. [6]

10. A level instrument was set up exactly mid-way between two pegs A and B 60 m apart and found true difference of level = 0.320 m. The level instrument was then set up at a point Q on the line AB 6m from B and inside of AB and following readings were taken at a and B. [5]

Instrument at	Sighted to	Staff readings S(m)
		Middle
Q	A	1.387
	B	1.069

Compute the correct staff readings on A and B when the line of collimation is exactly horizontal. Also compute collimation precision ratio.

11. What are the methods used to plot the theodolite traverse? State what errors are eliminated by repetition method. [4]

12. Calculate the mean horizontal angles. If necessary, adjust them also. [6]

Instrument	Sighted to	HCR Observation	
O		Face Left	Face right
	P	00°00'00"	179°59'40"
	Q	294°29'50"	114°30'20"
	R	137°54'20"	317°54'40"
	P	00°00'40"	180°00'20"

13. Define trilateration. Write down the General specifications of different types of triangulation. [4]

14. The following perpendicular offset were taken from a chain line to a hedge. [5]

Chainage (m)	0	5.5	12.7	25.5	40.5
Offset (m)	5.25	6.5	4.7	5.2	4.2

Find the area enclosed by the boundary, using any two method.

15. Find the volume by the trapezoidal and Prismoidal formula with the following data: [6]

Chainages(m)	0	30	60
Central depth of cut (m)	1.85	2.15	2.45

Formation width = 12 m, Side slopes = 2:1, Transverse slope = 6:1. Also calculate the Prismoidal correction.

16. What are the principles of actual operation of EDM? Describe the sources of errors of EDM. [4]

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE 504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. What is Surveying? Differentiate between Plane and geodetic surveying. [1+3]

2. How do you apply principle of surveying in two way linear distance measurement? Explain. [4]

3. Four bays of base line AB were measured under a tension of 120N and the data was given below. If the tape was standardised on the flat under a pull of 89N and a temperature of 20°C. Calculate the true length of line. [6]

Bay	Length (m)	Difference in level (m)
1	29.478	+ 0.294
2	29.208	- 0.384
3	29.396	+ 0.923
4	29.916	- 0.726

Filed temperature = 31°C; CSA of tape = 3.24 mm^2; density = 7700 kg/m^3; coefficient of linear expansion = 0.000001/°C; Young Modulus = 15.3 × 10^4 MN/m^2

4. What is chain survey? Describe principle and methods of chain survey. [4]

5. How can open traverse be checked during compass survey? Describe Bowditch method of adjustment of closed traverse graphically. [2+4]

6. During compass survey in link traverse from station M2 to M8, following observations were recorded. [6]

Station	Deflection angle (degrees)	Leg	Bearing (degrees)
M2	-70	M1-M2	105
A	+20	M2-A	
B	-90	A-B	
M8	+70	B-M8	
		M8-M9	36

Compute bearings of link legs. Check accuracy of work if least count of compass used is 1 degree. Correct affected bearings if necessary.

7. When do you recommend for permanent adjustment of a level? Describe with testing procedure. [4]

8. During permanent adjustment of level by two peg method following observation were made on staffs C and D held vertically 50 m apart on fairly level ground

Instrument at E mid of CD
Staff reading at C = 1.455 and Staff reading on D = 1.860
Instrument at F such that CF = 5m and DF = 45 m
Staff reading on C = 1.500 and staff reading on D = 1.925
Find the magnitude and direction of closing error and precision of instrument. What is the reading in C and D with respect to horizontal line of sight? [6]

9. Following staff reading were taken during a levelling operation at common interval of 20m. The respective staff readings are as follows
1.253, 1.752, 1.005, 0.675, 1.998, 0.825, 1.737, 1.444, 1.619, 0.750 and 2.619 m. The instrument is shifted after 4th, 6th and 9th readings. The RL of starting station is 1280 and that of end station is 1279.924 m respectively. Compute RL, apply necessary check and adjust RL of each station by any method.   [6]

10. Describe radiation and intersection methods of plane table survey.   [4]

11. What are fundamental lines in theodolite? Explain relationship among them.   [2+2]

12. Following angular observation were made during reiteration method of measurement by a theodolite. Compute the Horizontal angles included between survey lines OA, OB and OC by mean direction method. Apply necessary check and corrections if least count of instrument to be adopted is 1 minute. Also find missing data in VCR.   [6+2]

Inst stn	Sighted to	Face	HCR observation			VCR observation		
			D	M	S	D	M	S
O	A	L	00	00	00	65	45	00
		R	180	00	00	?	?	?
	B	L	100	40	40	?	?	?
		R	280	39	50	268	55	00
	C	L	161	20	40	?	?	?
		R	341	20	20	300	40	00
	A	L	00	00	20			
		R	180	00	00			

13. Differentiate between triangulation and trilateration with advantages and disadvantages.   [4]

14. Compute the area of the following traverse by DMD method.   [4]

Line	Latitude (m)	Departure (m)
AB	0.00	405.85
BC	182.00	0.00
CD	87.50	-151.55
DE	-85.50	-148.10
EA	-184.00	-106.20

15. The width of formation level of a certain cutting is 8m and the side slopes are 1:1. The surface of the ground has a transverse slope of 1 in 6. If the depths of cutting at the Centre lines of three sections 30 m apart are 2 m, 3 m and 4 m respectively. Determine the volume of earth work involved in this length of cutting by trapezoidal approach and prismoidal approach. Also find prismoidal correction.   [5+1]

16. Describe Principles of Electronic Distance Measurement.   [4]

***

Subject: - Surveying I *(CE 504)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. Explain principle of surveying illustrating examples. [4]

2. Tabulate the various errors occurred in taping with their sources and directions. A 30m steel tape was standardized in catenary conditions under a pull of 15 kg and found to be 30.006m. This tape was used to measure a distance of 86m in catenary conditions at a pull of 15 kg. Supports were provided at every 15m. The weight of the tape was 30gm/m. Apply necessary tape corrections for the measured length of line. [3+4]

3. Explain the criteria for selecting suitable scale. A map is drawn to some scale so that a plot of 6.304 ha is represented by 4.7 cm × 4.6 cm on the plan. Calculate the suitable RF of scale of the map and draw a scale to read upto a meter from the map and scale should be long enough to measure upto 500m. Also indicate 123.400m in the scale. [2+4]

4. What are the major considerations while selecting the main station and lines of chain survey? How would you decide the number of offsets based on the objects? [2+2]

5. How can the accuracy of a closed traverse be checked and adjusted if necessary, in compass traverse. [2+2]

6. The fore bearing of line AB of a link traverse ABCDEF is 61°06′00″. The right turn angles were observed as follows: ∠B = 93°06′50″, ∠C = 155°45′30″, ∠D = 247°09′40″ and ∠E = 90°58′20″. If the bearing of the last line observed was 108°05′40″. Check whether the observations for angles are correct or not. If not compute the correct bearings of all lines. [6]

7. Explain with neat sketch profile leveling and cross section leveling. What are the uses of these in civil Engineering? [2+3]

8. Reciprocal leveling was conducted across a wide river to determine the difference in level of points A and B, A situated on one bank of the river and B situated on the other. The following results on the staff held vertically at A and B from level stations 1 and 2 respectively, were obtained. The level station 1 was near to A and station 2 was near to B. [2+2+2]

Instrument at	Staff reading (m)	
	A	B
1	1.486	1.726
2	1.191	1.416

a) If the reduced level of B is 1160.18m above the datum, what is the reduced level of A?

b) Assuming that the atmospheric conditions remain unchanged during the two sets of the observations, calculate the collimation error, precision ratio, the combined curvature and refraction correction if the distance AB is 300 m.

9. During fly leveling the following note is made.

    B.S: 0.62, 2.05, 1.42, 2.63 and 2.42 m

    F.S.: 2.44, 1.35, 0.53 and 2.41 m

    The first B.S was taken on a BM of RL 1470 m. From the last B.S. it is required to set 4 pegs each at a distance of 30 m on a rising gradient of 1 in 200. Enter these notes in the form of a standard level book and calculate the R.L. of the top of each peg by the rise and fall method. Also, calculate the staff readings on each peg. [6]

10. What are the methods of orienting of plane table? Describe the methods of plane table surveying with their salient features. [4]

11. List out the errors which are eliminated by taking face observations of theodolite; also explain the mechanism of elimination with neat sketches. Explain the working principles of micrometer optical theodolite. [2+2]

12. The following observations were recorded in a theodolite traverse ABCDEA. Compute the mean horizontal angles and adjust them if necessary. Also calculate the VCR and VA when sighted from station A to target stations E and B. [6]

Inst. Station	Target Stn	Horizontal Circle Reading		Vertical Circle Reading	
		Face Left	Face Right	Face Left	Face Right
A	E	0°0'0"	180°0'40"	65°10'30"	??
	B	128°47'20"	308°47'40"	??	297°25'40"
B	A	0°0'0"	180°0'40"		
	C	102°6'40"	282°6'40"		
C	B	0°0'0"	180°0'20"		
	D	108°52'20"	288°53'0"		
D	C	0°0'0"	180°0'0"		
	E	91°0'0"	271°0'0"		
E	D	0°0'0"	180°0'0"		
	A	109°11'20"	289°12'0"		

13. Explain the advantages of trilateration over triangulation. List out the general specifications of primary triangulation. [4]

14. Calculate the area of transverse by double meridian distance methods. [4]

Line	AB	BC	CD	DE	EA
Latitude (m)	+218	-277	-109	-207	+375
Departure (m)	+202	+80	-332	-301	+351

15. Find the volume of earthwork by trapezoidal and Prismoidal formula in three consecutive sections at 30m interval. Formation level of starting chainage = 1201.85m. Formation width = 6m. Downward slope of formation = 100:1, Side slope = 2:1 and transverse slope = 6:1. The ground has an upward gradient of 50:1. The depth of cutting at 0 chainage is 1.65m. Compute the prismoidal correction also. [6]

16. What is EDM? Explain the operational principles of EDM measuring distances. [4]

***

Subject: - Surveying I (CE 504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. What do you mean by surveying? List out the secondary disciplines of surveying.   [1+3]

2. A 1.5 km long road is indicated in a map by a length of 37.5 cm. Find the scale of the plot and indicate through a sketch how a suitable scale can be constructed to read upto 1 m in the map.   [4]

3. Tabulate the various errors occurred in chaining/taping with their sources and directions. A 20m steel tape was standardized in catenary conditions under a pull of 10 kg and found to be 20.006m. This tape was used to measure a distance of 86m in catenary conditons at a pull of 10 kg. Supports were provided at every 10m. The weight of the tape was 30gm/m. Apply necessary tape corrections for the measured length of line.   [2+6]

4. What is the principle of chain surveying? Compare the well condition triangle with error.   [4]

5. Explain the method of compass traverse adjustment as you done with neat sketch.   [4]

6. The fore bearing of line AB of a link traverse ABCDEF is 61°06'00". The angle to the right at stations with theodolite were observed as follows: $\angle B = 93°06'50"$, $\angle C = 155°45'30"$, $\angle D = 247°09'40"$ and $\angle E = 90°58'20"$. If the BB of the last line observed was 108°05'40". Check whether the observations for angles are correct or not. If not compute the correct bearings of all lines.   [8]

7. Explain the principles of leveling. Which types of errors are eliminated by balancing of sight, illustrates with suitable examples.   [3+2]

8. During fly leveling, the following staff readings were noted: [6]
   BS = 0.63, 2.05, -2.424, (B) and 2.56m
   FS= 2.444, 1.35 and -2.42m.
   The (B) was taken on a BM of RL 1280.00m. From the last point, it is required to set up 4 pegs each at 30m interval on a falling gradient of 1 in 200.
   a) Prepare the level book and calculate the RL of the top of each peg by rise and fall method.
   b) Also calculate the staff readings on each peg and apply usual checks.

9. Determine the RL of station B of a bridge axis AB of axis length 58.60m from the following information. If RL of station A was 1295m. Apply necessary check.   [5]

Instrument near to	Sighted to	Staff reading		
		T	M	B
A	A	1.57	1.559	1.548
	B	1.9	1.585	1.271
B	A	1.96	1.647	1.335
	B	1.685	1.671	1.659

10. What are the principles of plane table surveying? List out the advantages and disadvantages of plane table surveying. [4]

11. List out the errors which are eliminated by taking face observations of theodolite; also explain the mechanism of elimination with neat sketches. Explain in brief about the temporary adjustment of theodolite. [2+2]

12. The following observations were recorded in a theodolite traverse ABCDA. Rule out the proper filed book and compute horizontal angles and adjust them if necessary. [6]

Instrument station	Target station	HCR observation	
		Direct	Reversed
A	D	90°00'10"	269°59'40"
	B	200°25'40"	20°25'30"
B	A	89°59'30"	270°00'10"
	C	180°16'10"	00°16'00"
C	B	90°00'10"	270°00'10"
	D	179°08'40"	359°08'20"
D	C	89°59'50"	270°00'00"
	A	160°12'40"	340°12'30"

13. Explain the principle of triangulation. List out the general specification of third order triangulations survey. [4]

14. Calculate the area of the following traverse by using DMD method. [4]

Line	AB	BC	CD	DA
Latitude (m)	225.28	-139.61	-336.90	251.23
Depature (m)	227.26	417.26	-196.47	-448.05

15. A roadway embankment of formation width of 10m and side slope 2:1 is to be constructed. The ground level along the centre line is as follows:

Change	0+000	0+040	0+080	0+120	0+160
GL (m)	1115.70	1114.30	1116.75	1115.15	1118.45

The embankment has arising gradient of 1 in 100 and the formation level at zero chainage is 114.95m. Assuming the ground level across the centre line, compute the volume of Earth work. [6]

16. What is EDM? Explain the fundamental principles of EDM measuring distances. [4]

***

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2075 Chaitra

Exam.		Regular / Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE 504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. What is surveying? Explain about the four major principles of surveying. [4]

2. Describe the various types of errors in surveying. [4]

3. A steel tape was standardized in catenary at 7 kg pull. Distance of 360m was measured with this tape under a pull of 5 kg. Assuming that the tape was supported at every 20m length, determine the correct length of line if the weight of tape=10gm/cc and cross sectional area of tape=0.03cm². Take $E = 210 \times 10^3$ N/mm². [4]

4. A plan represents an area of 39672m² and represents 4.75cm x 5.22cm on plan. Find the scale of the plot and indicate through a sketch how a suitable scale can be constructed to read up to 1m on the plan. The scale should be long enough to measure upto 400m. [4]

5. How would you adjust closing error graphically in compass traverse. Explain with neat sketches. [4]

6. Why is it necessary use well conditioned triangle? Explain the importance of the tie line in chain survey. [4]

7. The following table gives the FB and BB of the sides of a closed compass traverse PQRSTP. [8]

line	PQ	QR	RS	ST	TP
FB	188°45'	119°15'	346°30'	337°00'	293°30'
BB	7°45'	298°15'	168°30'	158°30'	113°00'

Check the bearings for local attraction. Correct the bearing by the method of included angles.

8. What is closing error in level circuit? How the closing error can be adjusted in a level circuit, explain them. [4]

9. Following readings were taken during a leveling work from TBM1 to TBM2 2.191, 2.505, 2.325, 1.496, 3.019, 2.513,(-)1.685, 2.811, 1.752, 3.824m. Level instrument was changing after 4th and 8th readings. Enter the above readings in a level field book format and compute RLs of all the points and adjust the RLs if error arises. RLs of TBM1 and TBM2 are 1449.870 and 1448.710m respectively. [6]

10. The following staff reading were taken during a reciprocal leveling: [6]

Instrument at near	Staff reading on	
	A	B
A	1.252	1.052
B	1.419	1.253

If the distance AB is 250m, compute the RL of B. If RL of A is 1450.500m, find the combined correction, collimation error and correct reading for A during second setup.

11. What is plane table surveying? Explain the intersection method and its advantages. [4]

12. Explain about construction principle of theodolite and function of micrometer screw in optical theodolite. [4]

13. Using mean direction method, calculate the mean horizontal angle. [6]

Instrument at	Sighted to	Set	HCR observation	
			Left Face	Right Face
O	A	I	00°00'00"	179°59'30"
	B	I	121°00'00"	301°00'20"
	A	II	90°00'10"	269°59'40"
	B	II	211°00'40"	31°00'20"

14. Explain the classification of triangulation system. [4]

15. The offsets in meter from a survey line to an irregular boundary line are given below: [4]

chainage (m)	0	10	20	30
Offset (m)	4.6	7.2	9.6	6.4

Calculate the area enclosed by 1st line, last line, survey line & boundary line using Simpson's rule and trapezoidal rule.

16. Find the volume of cutting in a length of 60m with the following data for a two level section using the prismoidal and trapezoidal formula. Also calculate the prismoidal correction. Formation width 9m, side slope = 2:1, transverse slope =6:1. The ground level at 30m intervals are given below.

Chainages (m)	0	30	60
Ground level (m)	1181.50	1181.80	1182.40

The formation has a downward slope of 1 in 40 with the formation level at 0+000 chainage being 1179.000m. [6]

17. Write short notes on principles of EDM. [4]

***

Exam.		**Back**	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I *(CE504)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. List out the principles of surveying and describe any two of them. [4]

2. A map is drawn to some scale so that a plot of 51750 m^2 is represented by 4.6cm × 4.5cm on the plan. Calculate the RF of the scale of the map. Draw a scale to read up to a single metre from the map and scale should be long enough to measure upto 600m. [4]

3. A tape of nominal length 30 m is standardized in catenary at 50N tension and found to be 29.8950m. If the mass of the tape is 0.015 kg/m, calculate the horizontal length of a span recorded as 23 m. [6]

4. What is the need of a reference sketch of stations? Explain by giving the sample page of a detailing field book and how offsets values are to be measured and recorded in the detailing field book? [4]

5. Define closing error. Describe about the various plotting method in compass traverse. [4]

6. The following observations were taken with a compass in case of a closed traverse. Calculate the angles and correct the bearings for local attraction, if any. Calculate the true bearings, if declination is 1°30′ East. [8]

Line	FB	BB	Declination
AB	51°30′	230°00′	1°30′
BC	182°45′	2°30′	
CD	4°00′	284°45′	
DE	165°15′	345°45′	-
EA	251°30′	71°30′	

7. Suggest a best method to transfer RLs from one bank of river to the other bank with derivation. Which type of errors are removed by this above method? [4]

8. The following consecutive readings were taken with a dumpy level and a 4m staff on a continuously sloping ground on a straight line at a common interval of 30m.
0680, 1.455, 1.855, 2.880, 2.800, 3.380, 1.055, 1.860, 2.265, 3.540, (B) 0.835, 0.945, 1.530 and 2.445.

The RL of B was 1180.750m. Rule out a page of a level field book and enter above readings. Calculate the RLs of the points by the rise and fall method, and also the gradient of the line joining the first and last points. [6]

9. Following staff readings were noted during a two peg test operation:

Instrument Station	Staff Readings		Remarks
	A	B	
At mid point P	1.585	1.287	Distance between A and B = 60.00m
Near A i.e. 6m inside between A and B	1.355	1.045	

Compute the collimation precision. If error is there, compute the correct readings for A and B during II set up and describe the procedure for making the line of collimation in horizontal. [4+2]

10. What are the principles of plane table surveying? Describe the process of Orientation of plane table by Back sighting with supporting sketch. [4]

11. Explain temporary adjustments of theodolite survey. [4]

12. A direction theodolite with a least count of 10" is set over station 'O' to measure direction to stations A, B, C and D. The observed circle readings are as follows: Compute the mean horizontal angle and adjust them if necessary. Also calculate, missing data of vertical circle reading. [6]

Instrument	Target Station	Telescope	Horizontal Circle Readings	Vertical Circle Readings
O	A	Direct	00°00'10"	120°15'10"
		Reversed	180°00'20"	?
	B	Direct	60°55'10"	?
		Reversed	240°55'20"	308°51'40"
	C	Direct	140°50'50"	?
		Reversed	320°51'20"	269°15'10"
	D	Direct	270°20'10"	177°20'10"
		Reversed	90°20'20"	?
	A	Direct	0°00'20"	89°00'10"
		Reversed	180°00'30"	?

13. Describe selection criteria of Triangulation and Trilateration stations. What are the field applications of Triangulation? [4]

14. From the chainages and offsets given below, find the area between the boundary, the first and last offsets and base line. [4]

Chainages(m)	0	12	20	25	34	42	52
Offsets (m)	0	6.9	7.6	9.8	10.2	9.9	6.8

15. Find the volume of filling in a length of 50m with the following data for a two level section, using the trapezoidal and prismoidal formula, where formation width = 10m, side slope 2:1, transverse slope = 8:1. The ground level at 25m interval are given below.

Chainages (m)	0	25	50
RL of GL	1080.50	1079.80	1078.40

The formation has a downward slope of 1 in 50 with the formation level at 0 chainage being 1081.50m. [8]

16. What is EDM? Describe about the principles of distance measurement techniques in EDM. [4]

***

Subject: - Surveying I *(CE504)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions. -
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Mention the various fundamental principles of surveying and describe about the major three of them by giving suitable examples. [4]

2. What are the selection criteria of scale for drawing a map? A rectangular plot of land of area 0.55 hectare is represented on a map of similar rectangle area of 6.11 cm^2. Calculate the representative factor of the scale of the map. Draw a scale to read upto a meter from the map. The scale should be long enough to measure upto 400m. [2+4]

3. A 30m steel tape was standardized in catenary condition under a pull of 5 kg and found to be 30.008m. This tape was used to measure a distance of 66m in three equal span in catenary conditions at a pull of 5 kg. The weight of tape was 30 gm/m. Apply necessary tape correction for the measured length of line. [6]

4. Why and how to take offsets to different objects? Describes briefly with neat sketches of detailing field book of chain survey. [4]

5. What is misclosure in compass traverse? Describe about the graphical adjustment of such misclosure during plotting of compass traverse. [4]

6. The fore bearing of line AB of an open traverse ABCDEFGH is 81°45'. The deflection angles between the lines were measured with a theodolite and were as follows: 25°30'(R) at B, 37°45'(L) at C, 45°15'(R) at D, 55°30'(L) at E, 75°15'(L) at F and 80°00'(R) at G. If the FB of the last line observed was 63°00'. Check whether the observations for deflection angles are correct or not. If not compute the correct bearings of all the lines. [8]

7. Discuss briefly the effect of curvature and refraction in levelling. Derive an expression for curvature correction and for combined curvature and refraction correction. [4]

8. A page of a level field book with some missing data are given below. Find those missing data and calculate the reduced levels of all the points. [6]

Stations	BS	IS	FS	Rise (+)	Fall (-)	RL (m)	Remarks
A	3.250					1249.260	
B	1.755		?		0.750		CP$_1$
C		1.950			?		
D	?		1.920	?			CP$_2$
E		2.340		1.500			
F		?		1.000			
G	1.850		2.185		?		CP$_3$
H		(-) 1.575		?			
I		?			2.820		
J	?		1.895		?		CP$_4$
K			(-) 1.350	?			
	∑BS = 12.795						

9. Reciprocal leveling was conducted across a wide river to determine the difference in level of points A and B, A situated on one bank of the river and B situated on the other. The following results on the staff held vertically at A and B from level stations 1 and 2, respectively, were obtained. The level station 1 was near to A and station 2 was near to B.

Instrument at	Staff reading on	
	A	B
1	1.486	1.726
2	1.191	1.416

If the reduced level of B is 1260.18 m above the datum, what is the reduced level of A? Assuming that the atmospheric conditions remain unchanged during the two sets of the observations, calculate

a) The combined curvature and refraction correction if the distance AB is 300 m, and

b) The collimation error [6]

10. Describe about the reliable method of orientation of plane tabling and at what circumstances intersection method of plane tabling is more preferable than radiation. [4]

11. Explain briefly about the temporary adjustments of a theodolite. [4]

12. The following observations were recorded in a theodolite traverse ABCDA. Compute the mean horizontal angles and missing readings by entering the following readings in a standard booking format. [6]

Instrument Stations	Target Stations	HCR Observations		VCR Observation	
		Direct	Reversed	FL	FR
A	D	89°59'50"	270°00'10"		
	B	160°12'40"	340°12'30"		
B	A	90°00'00"	269°59'40"	120°14'20"	?
	C	179°08'40"	359°08'30"		
C	B	90°00'00"	269°59'50"		
	D	200°25'40"	20°25'20"		
D	C	90°00'10"	270°00'00"	?	308°51'20"
	A	180°16'10"	00°16'00"		

13. Define trilateration. Write down the General specifications of 2nd and 3rd order triangulation. [4]

14. The following offsets were taken at 20m interval from a survey line to an irregular boundary line 0.00m, 1.53 m, 5.37 m, 3.50 m, 4.32 m, 7.25 m, 4.30 m, 6.55 m. Calculate the area enclosed between the survey line by(i) Trapezoidal Rule (ii) Simpson's 1/3 rule. [4]

15. Find the volume of cutting in a length of 60m with the following data for a two level section using the trapezoidal and prismoidal formula, where formation width = 9m, side slope 2:1, transverse slope = 6:1. The ground levels at 30m interval are given below.

Chainages (m)	0	30	60
RL of GL (m)	1181.50	1181.80	1182.40

The formation has a downward slope of 1 in 40 with the formation level at 0(zero) chainage being 1179.00m. [6]

16. What are the principles of actual operation of EDM? Describe the sources of errors of EDM. [4]

***

05   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I *(CE504)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt **All** questions.*
✓ *The figures in the margin indicate **Full Marks**.*
✓ *Assume suitable data if necessary.*

1. a) Define surveying. Explain its importance of civil engineers. [4]

   b) Explain perpendicular and oblique offset with neat sketch. [4]

   c) A steel tape was exactly 20 m long at 20°C when supported throughout its length under pull of 100 N. A line was measured with this tape under pull of 160N at mean temperature of 30°C and found to be 1020 m long. The cross sectional area of tape is 0.03 cm^2, weight per meter length is 24 gm, coefficient of thermal expansion for steel is 11×10^{-6}/°C and modulus of elasticity of steel is 2.1×10^6 kg/cm^2. Find true length of line if tape was supported at every 10 m during measurement. [8]

2. a) Explain whole circle bearing and reduced bearing of Compass Survey with neat sketch. [4]

   b) Write the propagation of electromagnetic energy. [4]

   c) The bearing of a closed traverse ABCDEEA are given as follows, find the stations affected by local attraction and correct them if necessary. [8]

Line	Fore Bearing	Back Bearing
AB	216°30'	36°10'
BC	135°55'	316°25'
CD	81°30'	260°30'
DE	321°10'	141°20'
EF	246°20'	66°50'
FA	299°20'	119°00'

3. a) State the points to be considered in fly leveling. [4]

   b) Explain reciprocal leveling with neat sketch. [4]

   c) The following consecutive readings were taken with a Level and a 4 m leveling staff on continuously sloping ground at a common interval of 30 m. [8]

   0.585 on A, 0.936, 1.953, 2.846, 3.644, 3.938, 0.962, 1.035, 1.689, 2.534, 3.844, 0.956, 1.579, 3.016 on B

   The elevation of B was 1120.450. Make up the level field book and apply the usual checks. Find the gradient between first and last point.

4. a) The following offsets were taken from a chain line to hedge. [8]

Distance (m)	0	5	10	15	20	25	30	35	40
Offset(m)	0	2.5	5	7.5	8.8	7.5	6.5	3.5	0

Calculate the area enclosed between the chain line and hedge by,

i) The simpson's rule
ii) The trapezoidal rule

b) The following observations were recorded in a theodolite traverse ABCDA. Compute the mean horizontal angles and adjust them if necessary. [8]

Inst. Station	Target Station	Horizontal circuit reading	
		Face Left	Face Right
A	D	90°00'00"	269°59'30"
	B	204°25'40"	24°25'30"
B	A	90°00'00"	270°00'30"
	C	190°36'10"	10°36'00"
C	B	90°00'00"	269°59'50"
	D	169°08'40"	349°09'20"
D	C	90°00'00"	270°00'00"
	A	165°12'40"	345°12'30"

5. Write short notes on: (any four) [4×4]

i) Principles of chain survey
ii) Advantages and disadvantages of plane table survey
iii) Principle of triangulation and trilaleration
iv) Temporary adjustment of theodolite
v) Sources of error in leveling

***

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. a) Explain about the objectives of surveying. Differentiate between plane and geodetic surveying. [4]

   b) Give a list of sources of errors in linear measurements and say which of them are cumulative and which are compensating. [4]

   c) A steel tape was exactly 30 m long at 20°C when supported throughout its length under a pull of 10 kg. A line was measured with this tape under a pull of 15 kg and at a mean temperature of 32°C and found to be 780 m long. The cross section area of tape = 0.03 cm^2 and it's total weight = 0.693 kg. α for steel = 11×10^{-6} per °C and E for steel = 2.1×10^6 kg/cm^2. Compute the true length of the line if the tape was supported during measurement at every 15 m. [8]

2. a) With neat sketches explain about types of field books in chain survey. [4]

   b) Explain Graphical method of adjusting a traverse in compass survey. The following bearing was observed in a compass traverse. [4]

   c)

Line	FB	BB
AB	69°30'	246°30'
BC	191°30'	13°00'
CD	230°15'	53°00'
DE	262°45'	80°45'
EA	32°15'	210°30'

   At which of these stations would local attraction be suspected? Find the corrected bearing of the lines. [8]

3. a) Why reciprocal levelling is done? Also derive the formula for reciprocal levelling. [6]

   b) The consecutive readings taken during a levelling operation are as follows: 0.685, 1.315, -1.825, -0.635, 1.205, 1.235, 2.631, 1.355, -2.015. The instrument was shifted after the third and sixth readings. The third reading was taken to a benchmark of assumed elevation 100.00. Find the reduced levels of other points. [6]

   c) What is the purpose of L-sectioning and cross section levelling, Explain with field procedure. [4]

4. a) Explain temporary adjustments of theodolite survey. Also show the different fundamental lines of theodolite. [4]

b) During the Survey of suspension bridge the following observations were made in triangle ABC. AB is the bridge axis. The least count of the instrument is 01'00". [8]

Inst. Station	Sighted to	Horizontal circle reading	
		Face Left	Face Right
A	B	0° 00'00"	180°00'20"
	C	54°38'20"	234°38'00"
B	C	0° 00'00"	179°59'50"
	A	89°20'40"	269°21'00"
C	A	0° 00'00"	180°00'00"
	B	36°01'00"	215°58'20"

Compute the angles by mean direction method and correct them if necessary. If the length of line BC is 58.232m, find the span of bridge axis AB.

c) Explain briefly different types of triangles used in triangulation system with sketches. Write down the specification of 1st order triangulation. [4]

5. a) Explain the working principle of plane table survey and explain orientation by back sighting. [4]

b) Find the volume of cutting in a length of 60 m with the following data for a two level section using the prismoidal and trapezoidal (average end area) formula. Also calculate the prismoidal correction. Formation width = 9m, side slope = 2:1, transverse slope = 6:1. The ground levels at 30 m intervals are given below: [8]

Chainage: 0   30   60

GL (m):   281.50   281.80   282.40

The formation has a downward slope of 1 in 40 with the formation level at 0 chainage being 279.00 m.

c) Workout co-ordinates method for finding Area. [4]

***

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt __All__ questions.*
✓ *The figures in the margin indicate __Full Marks__.*
✓ *Assume suitable data if necessary.*

1. a) Explain distance measurement in sloping ground. [4]

   b) A 30 m steel tape was standardized in carenary condition under pull of 5 kg and found to be 30.015m. The tape was used to measure distance of 24.726 m in catenary conditions at a pull of 5 kg. The weight of the tape was 30 gm/m. Apply necessary tape correction. [6]

   c) A plan represents an area of 18000 m^2 and measures 8 cm×9 cm. Find the scale of the plot and indicate through a sketch how a suitable scale can be constructed to read up to 1 m in the plan. If the same plan is to be drawn on a topo sheet with a scale of 1:12500, what will be the represented area of that plan on the sheet? [6]

2. a) Explain calculation of internal angles in Q.B system. [4]

   b) Explain the field procedure for chain surveying. [4]

   c) The following bearings are observed in a compass traverse survey. [8]

Line	AB	BC	CD	DE	EA
Fore Bearing	S11°30'W	N67°30'E	N32°15'E	S82°45'W	S50°15'W
Back Bearing	N13°00'E	S66°30'W	S30°30'W	N80°45'E	N53°00'E

Apply necessary checks and determine the corrected bearings.

3. a) Explain personal errors in leveling, intersection method in plane table. [2+2]

   b) A leveling instrument was set up exactly mid way between two pegs 50 m apart at A and B. The staff readings were 1.875 and 1.790 m respectively. The level was shifted to a point 5 m from B on the line AB produced and the staff readings were 1.630 and 1.560 m. Determine the correct staff readings when the line of columniation is exactly horizontal during 2nd set up. [6]

   c) Following readings were taken during a leveling work from TBM$_1$ to TBM$_2$.

     2.191, 2.505, 2.325, 1.496, 3.019, 2.513, 2.811, 1.752 and 3.824 m. Level instrument was changed after 4th and 7th readings. Enter the above readings in a level book format and compute RLs of all the point and adjust the RLs if error arise. RLs of TBM$_1$ and TBM$_2$ are 449.870 and 448.710 m respectively. [6]

4. a) Explain triangulation, trilateration and graphical intersection in plane tabling. [6]

b) Explain about the construction principles of theodolite and uses of theodolite. [4]

c) The following observations were recorded in a theodolite traverse ABCDEA. Compute the mean horizontal angles and adjust them if necessary. [6]

Inst. Stn	Target stn	HCR observation	
		Direct	Reversed
A	D	90°00'10"	269°59'40"
	B	200°25'40"	20°25'30"
B	A	89°59'30"	270°00'10"
	C	180°16'10"	00°16'00"
C	B	90°00'0"	269°59'50"
	D	179°08'40"	359°08'20"
D	C	89°59'50"	270°00'10"
	A	160°12'40"	340°12'30"

5. a) What is EDM? Explain principles of EDM for measuring horizontal distances. [4]

b) Find the volume of cutting in a length of 60 m with the following data for a two level section using the prismoidal and trapezoidal formula (average end area). Also calculate the prismoidal correction. Formation width = 10 m, Side slope = 2:1, Transverse slope = 6:1. The ground levels at 30 m intervals are given below. [8]

Chainage (m)	0	30	60
GL (m)	540.70	541.00·	541.60

The formation has a downward slope of 1 in 40 with formation level at 0 chainage being 538.20 m.

c) Calculate the area of transverse by double meridian distance method. [4]

Line	PQ	QR	RS	SP
Latitude (m)	-300	640	100	-440
Departure (m)	450	110	-380	-180

***

Subject: - Surveying I *(EG525CE)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt any **Five** questions.*
✓ *The figures in the margin indicate **Full Marks**.*
✓ *Assume suitable data if necessary.*

1. a) Define the term surveying. Differentiate between geodetic surveying and plane surveying. [4]

   b) What is graphical scale? Explain its importance on the map. [4]

   c) A 30 m tape weighing 8.9 N and has a cross sectional area of 2.58 mm^2 was standardized and found to be 30.005 m at 20° C with 52 N tension at fully supported condition. This tape was used for mearsuring the distances at contant temperature of 31.2° C and pull applied 110 N. The tape was supported at 0 and 30 m end. The observed distance was 630 m. Calculate the correct horizontal distance between points. Take coefficient of linear expansion of tape $\alpha = 12 \times 10^{-6}$/°C and Young's modulus of elasticity of tape material. $E = 12\times10^{11}$N/m^2. [8]

2. a) Explain basic principles of chain survey and describe the field procedure of chain survey. [6]

   b) The following bearings were observed in a compass traverse. [10]

Line	AB	BC	CD	DE	EA
FB	305°00′	75°30′	115°30′	166°30′	225°00′
BB	125°30′	254°30′	297°30′	345°00′	450°00′

   At what stations do you suspect local attraction? Find the correct bearings of all the lines.

3. a) Explain about graphical adjustment of compass traverse. [6]

   b) Explain the principles of levelling. Describe reciprocal levelling with sketch. [10]

4. a) A levelling operation is carried out in a closed loop. Fill all the missing data of a levelling field book and do the arithmetic check also. [10]

Stations	BS	IS	FS	Rise	Fall	RLs(m)
A	?					?
B		2.572			0.319	295.909
C	?		1.987	?		?
D		0.918			0.236	?
E	?		?	1.433		?
F			2.115	?		298.848
G		1.750		?	?	
H	?		2.057	?	?	
A			1.456		1.847	?

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. a) Define the term surveying and differentiate between geodetic and plane surveying. [4]

   b) What are the corrections applied in the linear measurement? Explain briefly. [4]

   c) A 20m steel tape standardized in catenary at a temperature of 12.5°C and a pull of 100N was found to be 19.978m. This tape was used to measure a base line. Throughout the measurement the tape was used in catenary for each tape length. Find the correct length of the baseline if the temperature during measurement was 25°C and pull applied was 150N weight of steel is 0.077 N/cm^3. The weight of suspended tape was 7.85 N. Take E = 2.10×10^{5}N/mm^2 and ∝ = 12×10^{-6}/°C. The measured base line distance was 1120m. [8]

2. a) Explain briefly about the field produre of chain survey. [4]

   b) Explain briefly about radiation and intersection methods of plane table survey, [4]

   c) The following bearings were observed in a compass traverse. [8]

Line	AB	BC	CD	DE	EA
FB	305°30'	75°30'	115°30'	166°30'	225°00'
BB	125°30'	254°30'	297°30'	345°00'	44°00'

   At which stations do you suspect local attraction? Find the correct bearing of all the lines.

3. a) In which condition reciprocal levelling is used. Also derive the formula for reciprocal levelling. [6]

   b) A levelling operation is carried out in a closed loop. Fill all the missing data of a levelling field book given below: [10]

Station	BS	IS	FS	Rise	Fall	RL
A	?					?
B		2.572			0.319	295.909
C	?		1.987	?		?
D		0.918			0.236	?
E	?		?	1.433		?
F	1.372		2.115	?		298.848
G		1.750			?	?
H	?		2.057		?	?
A			1.456		1.847	?

4. a) What are the temporary adjustments in theodolite survey? Explain. [8]

   b) Develop a booking formate for recording 2 set horizontal angle with appropriate numerical example. Calculate the mean horizontal angle also. [4]

   c) Distinguish between triangulation and trilateration. [4]

5. a) What is meridian distance and double median distance? How it can be calculate? [4]

   b) Write the working principle of EDM equipment. [4]

   c) Calculate the area by the coordinate method from the following perpendicular offsets taken from a chair line to a boundary. [8]

Chainage (m)	0.00	3.75	6.50	11.30	16.45
Offsets (m)	1.45	2.50	2.95	2.10	2.35

***

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I (CE 504)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. a) Differentiate between geodetic and plane surveying. [2]

   b) Explain briefly how a distance can be measured by the method of phase comparison. [6]

   c) A 30m steel tape standardized in fully support condition at a temperature of 20°C and pull of 100N was found to be 19.985m. This tape was used to measure a line under a pull of 120N and a mean temperature of 17°C was found to be 1350m long. Throughout the measurement, the tape was used in catenany condition. Find the correct length of the line. Take weight of steel as $0.081 N/cm^3$, the weight of tape as 11.775N, $E = 2.10 \times 10^5 N/mm^2$ and $\alpha = 11 \times 10^{-6}/°C$. [8]

2. a) What are the methods of plane table survey? Explain each. [4]

   b) What is principle of chain survey? Explain in brief. [4]

   c) Following are the bearings observed in a compass traverse survey. At what stations do you suspect local attraction? Correct them by applying suitable correction method. [8]

Line	FB	BB
AB	191°30'	13°00'
BC	79°30'	256°30'
CD	32°15'	210°30'
DE	262°45'	82°15'
EA	230°15'	53°00'

3. a) What do you mean by two peg test? [4]

   b) A level was set up at mid point between two stations A and B. The distance to stations A and B was 60m and the reading on the staff held at stations A and B was 1.855m and 1.625. Then level was moved near to station B and the reading on the staff held at A and B was 2.385m and 2.655 respectively. Calculate the collimation error and its sign (upward or down ward). [12]

4. a) Explain classification of Triangulation system. [6]

   b) Prepare a field note of measurement of horizontal angles by direction and repetition methods. [10]

5. a) Explain area calculation by double meridian method. [8]

   b) Workout prismoidal formula to calculate volume. [8]

***

Exam.		Regular / Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. a) Distinguish between plane and Geodetic surveying and how do you classify the surveying in various ways? [8]

   b) A steel tape was exactly 20m long at 10°C when supported throughout it's length under a pull of 5 kg. A line measured with this tape under a pull of 16 kg and at a mean temperature of 22°C, was found to be 680m long. Assuming the tape is supported at every 10m; find the true length of the line. Give that the cross sectional area of the true length of the line. Given that the cross-sectional area of the tape = 0.03 sq.cm, $E = 2.1 \times 10^6$ kg/sq.cm, $\alpha = 11 \times 10^{-6}$ per°c, weight of tape = 10gm/cu.cm. [8]

2. a) What is meant by relative error of closure in compass traversing? Explain the adjustment of error graphically. [8]

   b) The following observations were taken in a closed traverse ABCDEA where local attraction was suspected. [8]

Line	FB	BB
AB	191°30'	13°00'
BC	69°30'	246°30'
CD	32°15'	210°30'
DE	262°45'	80°45'
EA	230°15'	53°00'

   Give the corrected bearings of the traverse legs by included angle method.

3. a) What is profile levelling? Explain the term "balancing of sight" in leveling operation. [8]

   b) The following consecutive readings were taken with a level and 5 meter levelling staff on a continuously sloping ground at a common interval of 20 meters, 0.385 (Point A), 1.030, 1.925, 2.825, 3.730, 4.685 (Point B), 0.625, 2.005, 3.110, 4.485 (Point C), 0.975, 1.382, 1.836, 2.702, 3.59 (Point D). The reduced level of the point B was 1200.800m. Rule out a page of a level field book and inter the above readings. Calculate the reduced levels of the points by rise and fall method and the gradient of the line joining the first and the last point. [8]

4. a) Differentiate between triangulation and trilateration and explain the principle of electronic distance measurement. [4+4]

b) The following observations were recorded in a theodolite traverse ABCDA. Compute mean horizontal angles and adjust them if necessary. [8]

Inst. St^n	Target st^n	Horizontal Circle Reading	
		Face Left	Face Right
A	D	90°00'10"	269°59'50"
	B	209°25'40"	29°25'30"
B	A	89°59'30"	270°00'10"
	C	180°16'10"	00°16'00"
C	B	90°00'00"	269°59'50"
	D	179°08'40"	359°08'20"
D	C	89°59'50"	270°00'10"
	A	160°12'40"	340°12'30"

5. a) i) Explain orientation by back sighting in plane table surveying. [4]

ii) What are the various offsets? Explain booking method for offsets in chain surveying. [4]

b) The following offsets were taken at 20m interval from a survey line to an irregular boundary line: 0.00m, 1.53m, 5.37m, 3.50m, 4.32m, 7.25m, 4.30m, 6.55m, 4.25m, 7.30m, 6.25m and 4.19m. Calculate the area enclosed between the survey line, the irregular boundary line, and the first and last offsets, by (i) Trapezodial Rule and (ii) Simpson's Rule. [8]

***

06   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt _All_ questions.
✓ The figures in the margin indicate _Full Marks_.
✓ Assume suitable data if necessary.

1. a) What are plane and geodetic survey? What are the secondary classifications of survey? [4+4]

   b) Differentiate between errors and mistakes with examples. [4]

   c) List eight methods of linear measurements. [4]

2. a) A steel tape 30m long weighs 0.7 kg and is used with supports at the ends only. A line is measured in three segments using a 5 kg pull and the length was recorded as 76.35m. What is the length of the line corrected for sag? [6]

   b) You are to conduct a chain survey field work. Make a list of persons and equipments you require for the purpose and give the salient procedural steps you will follow. [4]

   c) Define trilateration. Explain principles of electronic distance measurement (EDM). [2+4]

3. a) What are closing error and relative precision in compass traversing? How would you adjust it graphically? [3+4]

   b) The following angles to the right were obtained in a close link traverse in between two adjusted known lines XP and TY. Compute the angular misclosure, if any, on that traverse and adjusted bearings of the traverse lines. [9]

Stations	Angles to the right	Bearings
X		
P	92°30'	148°15'
Q	228°30'	
R	115°15'	
S	52°45'	
T	298°45'	
Y		36°45'

4. a) What is reciprocal levelling? Explain how precision could be checked during reciprocal levelling. [4+2]

   b) The following consecutive staff readings were taken by a level and 4m levelling staff on pegs at 15m interval on a continuously sloping ground. [10]

   0.895, 1.305, 2.805, 0.965, 2.695, 3.255, 1.120, 2.825, 3.450, 3.895, 1.685, 2.050 (Station A)

   RL of station A where the reading 2.050 was taken is known to be 1250.250m. From the last position of the instrument, two station B and C with RLs 1250.800 and 1251.250m respectively are to be established without disturbing the instrument. Workout the required staff readings at stations B and C and complete all the works in level book form.

5. a) A direction theodolite with a least count of 6 second is set over station D to measure directions to stations C, B and A. The observed directions from that position are as follows: [3+5]

Stations	Telescope	Horizontal Circle Readings
C	Direct	00°00′00″
	Reversed	179°59′48″
B	Direct	83°06′48″
	Reversed	263°06′36″
A	Direct	242°35′24″
	Reversed	62°35′12″

Compute an abstract of average direction of CD, CB and CA and compute the average angles of CDB, BDA and ADC.

b) Explain the procedure for solving two point resection of plane tabling. [8]

OR

What is triangulation? Write their specifications.

***

Exam.		Regular / Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. a) What are plane and geodetic survey? Write the principles of surveying. [8]

   b) Explain various corrections applied in linear measurement. [8]

2. a) Make a field book for chain survey. Explain various types of obstacles in chain survey and the methods to overcome those obstacles. [7]

   b) A 30m steel tape measured 30.015m when standardized fully supported under a 70N tension at a temperature of 20°C. The density of tape material is 7.75×10^3 kg/m^3 and had a cross-sectional area of 0.028cm^2. What is the true length of the recorded suspended distance AB for the following condition? Recorded distance = 114.095m. Mean temperature = 32°C. Tension applied = 100N, Elevation difference per 100m = 2.5m, $\alpha = 1.15 \times 10^{-5}$/°C, $E = 2.10 \times 10^5$ N/mm^2. Assume all full tape length except in the last one. [9]

3. a) Explain fore bearing, back bearing, quadrantal bearing and whole circle bearing and local attraction. [7]

   b) The following fore and back bearings were observed while traversing in an area with compass. [9]

Line	F.B.	B.B.
PQ	S 37°30' E	N 37°30' W
QR	S 43°15' W	N 44°15' E
RS	N 73°00' W	S 72°15' E
ST	N 12°45' E	S 13°15' W
TP	N 60°00' E	S 59°15' W

   Find the corrected bearings of the line and also the interior angles of the traverse.

4. a) What are cross-sections and profile levelling, explain briefly. [7]

   b) The following consecutive staff readings were taken by a level and 4m levelling staff on pegs at 15m interval on a continuously slopping ground. [9]

   0.895, 1.305, 2.805, 0.965, 2.695, 3.255, 1.120, 2.825, 3.450, 3.895, 1.685, 2.050 (Station A).

   R.L. of station A where the reading 2.050 was taken is known to be 1250.250. From the last position of the instrument, two station B and C with RL 1250.800 and 1251.000m respectively are to be established without disturbing the instrument. Work out the required staff readings at stations B and C and complete all works in level book form.

5. a) What is two point problem in plane table resection? Write advantages and disadvantages of plane table survey. [8]

   b) What is triangulation and trilateration? Write the specifications of different types of triangulations. [8]

***

01   · TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Jestha

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

Candidates are required to give their answers in their own words as far as practicable.
Attempt any **Five** questions.
The figures in the margin indicate **Full Marks**.
Assume suitable data if necessary.

1. a) What are plane and geodetic survey? Explain the principles of surveying. [7]

   b) A steel tape weighing 0.68 kg was standardised on the flat and found to have length 49.996m at 20°6C, tension 5 kg. It was used in catenary at the same tension to measure a horizontal base, at average temperature 26°C, and the readings on the successive sections were 49.105, 49.373, 48.976, 49.817 and 34.353. What was the correct length of the line. Take $\alpha = 12 \times 10^{-6}$ per °C. [9]

2. a) What are the obstacles in chain survey? Explain the methods of overcoming those obstacles. [7]

   b) P and Q are two points 400m apart on the same bank of the river. The bearing of a tree on the other bank observed from P and Q are N40°30'E and N37°45'W respectively. Find the width of the river if bearing of PQ is S85°30'E. [8]

3. a) What are the difference between prismatic compass and surveyor's compass? [8]

   b) Following bearings were observed with a compass for traversing. Find the amount of local attraction and correct bearings as well as true bearings if the magnetic declination is 7°W. [8]

Line	FB	BB
AB	59°00'	239°00'
BC	139°30'	317°00'
CD	215°15'	36°30'
DE	208°00'	29°00'
EA	318°30'	138°45'

4. a) What are cross-section and profile levelling? Explain with suitable sketches. [7]

   b) The following readings were successively taken with a level; [9]

   0.35, 0.487, 0.696, 1.675, 1.893, 2.416, 1.823, 0.487, 0.759, 1.350 and 2.057. The instrument was shifted after the forth and seventh readings. Prepare a level book and calculate the RLs of different points if the RL of the 4th point is 562.50m. Use both the methods.

5. a) What are radiation and intersection methods of P.T. survey, explain briefly. [8]

   b) Write the advantages and disadvantages of P.T. survey. [8]

6. a) What are the temporary adjustment in theodolite survey, explain. [7]

b) Find horizontal and vertical angles in the following cases. [9]
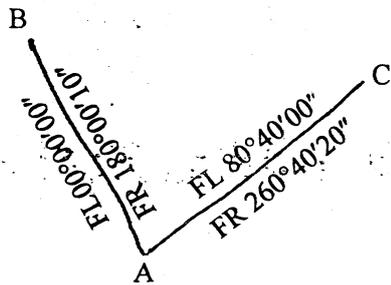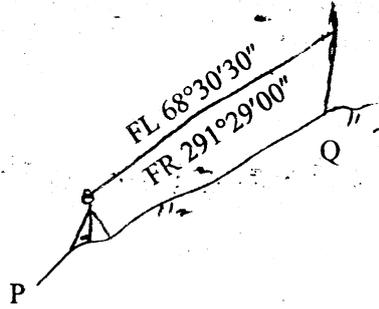
B

FL 100°00'00"
FR 180°00'10"

A

C

FL 80°40'00"
FR 260°40'20"

Find H.A. BAC

FL 68°30'30"
FR 291°29'00"

P

Q

Find V.A. P to Q

***

Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. a) What are the primary divisions of surveying? Explain the principles of surveying. [8]

   b) What are plain, diagonal and vernier scales? Make appropriate sketches and show some measurements. [8]

2. a) What are the various corrections applied in linear measurement? Explain. [7]

   b) A tape standardised as 29.995m in catenary at 110N and 15°C temperature is used in the field with a tension of 90N and 22°C mean temperature. Calculate the horizontal length if the recorded length is 120.0m. Assume mass of the tape = 0.0312 kgm^{-1}, Young's modulus of elasticity = 2.1×10^6 kg/cm^2, cross-sectional area of tape = 0.03cm^2, linear expansion of tape = 11×10^{-6} per °C. [10]

3. a) What are quadrantal and whole circle bearings, fore and back bearings and local attraction in compass survey, explain. [7]

   b) Find the corrected bearings of the following traverse and also the included angles. [9]

Line	FB	BB
AB	191°30'	13°00'
BC	69°30'	246°30'
CD	32°15'	210°30'
DE	262°45'	82°45'
EA	230°15'	53°00'

4. a) What are the cross-section and profile levelling? Explain with proper sketches. [7]

   b) During a fly levelling operation, the following observations were made: [9]

   BS: (−)1.650, 2.155, 1.405, 2.655, 2.435m

   FS: 2.455, 1.305, 0.555, 2.405m

   The first backsight was taken on a BM of RL 1290.500m with inverted staff. From the last backsight, it is required to set four pegs each at a distance of 20m on a falling gradient of 1 in 100. Calculate the RL (Reduce levels) of these four pegs. [9]

5. a) What are the methods of plane table traversing? Explain procedure for radiation and intersection and their suitability with sketch. [6]

b) The following are the field notes of theodolite survey on traverse ABCDA. [10]

Station	Sighted to	Horizontal Circle Readings					
		Face Left			Face Right		
		deg.	min.	sec.	deg.	min.	sec.
A	D	00	00	00	179	59	50
	B	60	42	20	240	42	10
B	A	00	00	00	180	00	10
	C	98	55	40	278	55	50
C	B	00	00	10	180	00	00
	D	82	12	30	262	12	20
D	C	00	00	10	179	59	50
	A	118	10	30	298	10	10

Compute the horizontal angles and correct them if necessary.

***

71   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2064 Jestha

Exam.		R	lar/Back	
Level	BE		Full Marks	80
Programme	BCE		Pass Marks	32
Year / Part	II / I		Time	3 hrs.

Subject: - Surveying I

/ Candidates are required to give their answers in their own words as far as practicable.
/ Attempt **All** questions.
/ The figures in the margin indicate **Full Marks**.
/ Assume suitable data if necessary.

a) Explain the principles of surveying. [6]

b) With the help of neat sketches, explain field procedure of chain surveying. [10]

a) Differentiate between cumulative and random errors. [6]

b) A 30m steel tape was standardised in catenary condition at a temperature of 20°C under a pull of 5kg and found to be 30.005m. The tape was used to measure the distance in fully support condition at a temperature of 25°C under a pull of 12 kg and found to be 28.00m. The cross sectional area of tape is $0.02cm^2$, its weight per unit length is 22gm/meter, Young modulus of elasticity $E = 2.0 \times 10^6$ kg/cm^2, coefficient of linear expansion of tape $\alpha = 11 \times 10^{-6}/°C$. Find the correct horizontal distance. [10]

a) Describe the field procedure of compass traversing. [6]

b) The observed fore and back bearings of the lines of a closed compass traverse are as follows. [10]

Line	FB	BB
AB	104°30′	284°30′
BC	48°00′	226°00′
CD	290°30′	115°15′
DA	180°15′	357°30′

Calculate the interior angles and correct them. Also compute the correct bearings of all the sides.

a) What is collimation error in level instrument? How is it detect and adjust in the field? [6]

b) In running a fly level from a bench mark of RL 1291.610m, the following readings were obtained. [10]

Back Sight : 2.543 (B.M.), 2.094, 1.916, 2.725
Fore Sight : 1.645, 1.436, 0.956, 1.855
Prepare a level book and compute reduced levels with necessary checks.

) What are the methods of resection? Explain briefly how is it solve by trial and error method. [6]

b) The following are . field note of thoedolite survey. [10]

Station	Sighted to	Horizontal circle reading (direct)			Horizontal circle reading (reverse)		
		degree	minute	second	degree	minute	second
A	C	0	00	10	180	00	00
	B	30	00	20	210	00	00
B	A	0	00	00	180	00	20
	C	60	00	00	240	00	10
C	B	0	00	10	180	00	00
	A	90	00	05	270	00	10

Compute horizontal angles and apply check.

***

Exam.	Regular / Back		
Level	BE	**Full Marks**	80
Programme	BCE	**Pass Marks**	32
Year / Part	II / I	**Time**	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. a) What are plane and geodetic surveying, explain briefly. Write the principles of surveying. [4+4]

   b) Explain what are the corrections applied in linear measurement. Sketch out plain, diagonal and vernier scales. [5+3]

2. a) Explain, how can you overcome different types of obstacles in chain survey. [6]

   b) A line was measured with a steel tape which was exactly 30 meters at 20°C at a pull of 100N, the measured length being 1650.00 meters. The temperature during measurement was 30°C and the pull applied was 150N. Find the length of the line, if the cross-sectional area of the tape was 0.025 sq.cm. The coefficient of expansion of the material of tape per 1°C = 3.5×10^{-6} and the modulus of elasticity of the material of the tape = $2.1 \times 10^{5} N/mm^{2}$. [10]

3. a) What is linear misclosure in compass traverse? Explain adjusting misclosure graphically. [6]

   b) The following bearings were observed in case of a closed traverse. At what stations local attraction is suspected. Compute the corrected bearings and find the interior angles of the traverse. [10]

Line	F.B.	B.B.
AB	S 40°30′ W	N 41°15′ E
BC	S 80°45′ W	N 79°30′ E
CD	N 19°30′ E	S 20°00′ W
DA	S 80°00′ E	N 80°00′ W

4. a) What are the methods of reducing the levels, explain briefly. [6]

   b) The following consecutive readings were taken with a level and a 4 meter levelling staff on continuously slopping ground at a common interval of 30m. [10]

   0.585 on A, 0.936, 1.953, 2.846, 3.644, 3.938, 0.962, 1.035, 1.689, 2.534, 3.844, 0.956, 1.579, 3.016, on B.

   The elevation of B was 1120.450. Make up a level field book and apply the usual checks. Find the gradient between first point and last point.

5. a) Explain briefly various methods of plane table survey. [8]

   b) Explain methods of measuring horizontal angles in theodolite survey. [8]

   ### OR

   Distinguish between triangulation and trilateration.

   ***

INSTITUTE OF ENGINEERING

Examination Control Division

2062 **Baishakh**

| Exam.		Regular/Back	
Level	B.E.	Full Marks	80 .
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. a) What are plain and geodetic surveying? Explain the principles of surveying with illustrative examples. [6]

   b) A 50m steel tape weighing 0.68 kg was standardised on the catenary and found to have length 49.996m at 20°C, tension 5 kg. Calculate the horizontal length of 30m span at 26°C. [10]

2. a) What are the obstacles in chain survey and how can you eliminate those obstacles, explain briefly. [6]

   b) A survey line AB is obstructed by a high building. To prolong the line beyond the building, a perpendicular BC 121.92m long is sit at B. From C two lines CD and CE are set out at angles of 30° and 40° with CB respectively. Determine the lengths CD and CE so that D and E may be on the prolongation of AB. If the chainage of B is 95.10m. Find the chainage of D. Draw a sketch showing all the points. [10]

3. a) Write in brief on variations in magnetic declination. [6]

   b) The following bearings were observed in running a compass traverse. [10]

Line	Fore bearing	Back bearing
AB	66°15′	244°0′
BC	129°45′	313°0′
CD	218°30′	37°30′
DA	306°45′	126°45′

   Find the corrected fore and back bearings, and the true bearings of the lines, given that the magnetic declination is 8°40′E.

4. a) What are cross-sections and longitudinal sections in levelling. Make appropriate sketches. [8]

   b) Distinguish between intersection and resection methods of plane table survey. [8]

5. a) Write the temporary adjustments in theodolite survey. [8]

   b) Find the horizontal angle ABC from the following field observations and also the vertical angle from P to Q. [8]
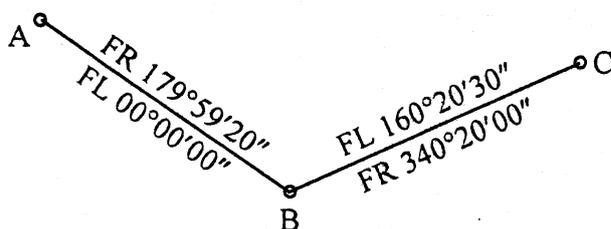
Find horizontal angle ABC.
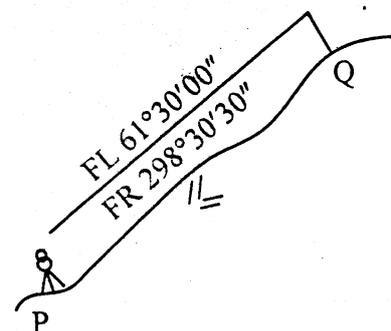
Find vertical angle from P to Q

***

05   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2062 Poush

Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. a) Distinguish between plane surveying and geodetic surveying. [4]

   b) Define ranging and explain the method of ranging when high ground intervenes between two stations. [4]

   c) The following slope distances were measured along a chain line with 30m tape. [8]

   Slope distance (m) = 25.50, 24.60, 28.70, 29.50 and 18.50

   Difference of elevation between ends (m) = 2.50, 5.30, 3.35, 2.50 and 1.50.

   It was noted afterwards that the tape was 2cm too long. Find the true horizontal distance.

2. a) Describe the working principle of plane table survey. [8]

   b) A chain line AB intersects a pond. Two points P and Q are taken on the chain line on opposite sides of the pond. A line PR, 230m long, is set out on the left of PQ and another line PS, 280m long, is set out on the right of PQ. Points R, Q and S are in same straight line. RQ and QS are 80m and 130m long respectively. Calculate the length of PQ. [8]

3. a) What do you mean by local attraction in compass surveying? List the sources of error and also explain the method of elimination of local attraction. [6]

   b) The following bearing were taken while conducting a close traverse with a compass. [10]

Line	FB	BB
AB	80°45′	260°00′
BC	130°30′	311°35′
CD	240°15′	60°15′
DA	290°30′	110°10′

   At what stations do you suspect local attraction? Find the corrected bearings and also the true bearings of each line if the magnetic declination was 5°E. [10]

4. a) Describe height of instrument and rise-fall method of reducing the levels. [6]

   b) The following consecutive readings were taken with a level at intervals of 20m. The chainage and R.L. of the first point are 200m and 525.50m respectively. [10]

   0.515, 1.720, 2.50, 3.455, 1.30, 2.460, 2.950, 3.650, 0.855, 2.430, 3.105

   The instrument was shifted after the fourth and eight readings. Find the RL of all the points and draw the longitudinal section. (In suitable proportions)

5. a) What are the fundamental lines of a theodolite? Explain it's relation with neat sketch when the theodolite is in proper adjustment. [7]

   b) Describe with sketches the methods of measuring horizontal and vertical angles by theodolite. [9]

***

Exam.		Regular / Back	
Level	B.E.	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / 1	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. a) What are plane and geodetic surveying? Write the principles of surveying. [6]

   b) To measure a base line, a steel tape 30m long supported at two ends standardised at 15°C with a pull of 100N (or 10 kgf) was used. Find the correction per tape length (fully support condition), if the temperature at the time of measurement was 20°C and the pull exerted was 160N (or 16 kgf). Weight of 1 cubic cm of steel is 0.0786N (or 0.00786 kgf) weight of the tape = 8N (or 0.8 kgf). $E = 2.1 \times 10^5$ kg/sq.cm. Coefficient of expansion of the tape per 1°C = 7.1×10^{-7}. [10]

2. a) Make a field sketch for chain survey and explain the complete process of mapping by linear measurement only. [8]

   b) Explain different types of obstacles in chain survey and the methods to overcome these obstacles. [8]

3. a) What are quadrantal and whole circle bearings? Explain magnetic declination, isogonic line and agonic line. [6]

   b) For the traverse of measured angles (angle to the left) are given in table below. Compute the adjusted angles and bearings to the nearest 0.1′. [10]

Station	Measured angles		Line	Known bearings
A	208° 7.6′		AW	234° 17.6′
B	101° 35.1′		DX	358° 18.5′
C	89° 05.3′			
D	17° 11.9′			

4. a) Explain profile levelling and cross-section levelling. [6]

   b) The following consecutive readings were taken with a level and a 4m levelling staff on a continuously sloping ground at a common interval of 30 metres. [10]

   0.855 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 (on B).

   The R.L. of B was 1380.500 make a level field book and apply usual checks. Determine gradient of line AB.

5. a) Write the temporary adjustments in a theodolite survey. [8]

   b) Distinguish between triangulation and trilateration. [8]

   OR

   Write various methods of plane table survey. [8]

***

Exam.		Regular / Back	
Level	B.E.	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / 1	Time	3 hrs.

Subject: - Surveying I

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. What are the primary division of surveying? [6]

   b) A tape of nominal length 30m is standardized in catenary at 40N tension and found to be 29.8850m. If the mass of the tape is 0.015 kg/m, calculate the horizontal length of 16m in fully support condition. [10]

2. a) Describe the different types of offsets and explain how they are measured in chain surveying. [6]

   b) What is meant by closing error is a closed traverse? How would you adjust it graphically? [10]

3. a) Explain profile levelling and cross-section levelling with suitable sketches. [6]

   b) The following consecutive staff readings were taken on pegs at 15m interval on a continuously sloping ground : 0.895, 1.305, 2.800, 1.960, 2.690, 3.255, 2.120, 2.825, 3.450, 3.895, 1.685, 2.050 (st. A).

   RL of station A where the reading 2.050 was taken is known to be 50.250m. From the last position of the instrument two stations B and C with RL 50.800 and 51.000 respectively are to be established without disturbing the instrument workout the staff reading at B and C and complete all the work in level book form. [10]

4. a) With the help of neat sketches describe fundamental lines of theodolite. [6]

   b) Find the mean horizontal angles BAC, CAD and DAE in following cases. [10]

		H.C.R.	
Instrument St.	Target St.	F.L.	F.R.
A	B	0°10'10"	180°10'20"
	C	62°10'10"	242°10'30"
	D	135°20'15"	315°20'35"
	E	250°30'20"	70°30'40"

5. a) Distinguish between triangulation and trilateration. [6]

   b) Write various methods of plane tabling. [10]

***

Original Copy

Exam.		Regular / Back	
Level	B.E.	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

Subject: - Surveying I

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

1. a) What are plane and geodetic surveying? Explain the principles of surveying. [6]

   b) To layoff a base line, a steel tape 30m long standardised at 15°C with a pull of 10kg supported at two ends was used. Find the correction per tape length, if the temperature at the time of measurement was 20°C and pull exerted was 16kg. Weight of 1 cubic cm of steel is 0.00786kg. Weight of tape = 0.8kg, $E = 2.1 \times 10^6$ kg/sq.cm. Co-efficient of expansion of the tape per 1°C $= 7.1 \times 10^{-7}$. [10]

2. a) Describe how would you range a survey line between two points which are not intervisible due to an interviewing raised ground. [6]

   b) What are possible obstacles in chain survey? Explain the methods of overcoming them and make a field sketch for detail survey by linear measurements (chain/tape). [10]

3. a) Explain (i) Optical-reading repeating theodolite and
              (ii) optical-reading directional theodolite. [6]

   b) Compute the angle misclosure and adjusted bearings in the following closed link traverse. [10]

   Adjusted bearing $AT_1 = 329°09'21''$

   Adjusted bearing $ET_2 = 105°36'08''$

   Angles (angles to the right) $A = 282°17'18''$
                                  $B = 266°48'13''$
                                  $C = 89°16'53''$
                                  $D = 96°36'05''$
                                  $E = 291°27'38''$

4. a) Explain the methods of reducing the levels. Apply arithmetic checks also. [6]

   b) A differential levelling loop began and closed on BM Gate (elevation 1237.280m). The BS and FS distances were kept approximately equal. Readings taken in order are 2.863 on BM Gate, 2.147 and 1.623 on TP_1, 2.500 and 2.027 on BMX, 2.410 and 0.933 on TP_2, and 0.370 on BM Gate. Prepare, check and adjust the notes. [10]

5. a) What are fundamental lines in theodolite and their desired relationships? [6]

   b) Explain with the help of neat sketches resection by three point problem. [10]

***

Exam.	Regular / Back		
Level	B.E.	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time.	3 hrs.

Subject: - Surveying

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.

1. a) Explain, what are the principles of surveying. Write various scales used in surveying. [6]

   b) Describe with the help of neat sketches field procedure of chain surveying. [10]

2. a) Explain principle of chain surveying. Describe what are the different types of offsets used and how they are measured in chain/tape surveying. [6]

   b) A chain line PQR crosses a river, Q and R being on the near and distant banks respectively. A perpendicular QS, 90m long is set out at Q on the left of the chain line. The respective bearings of R and P taken at S are 87°30'20" and 177°30'20". Find the chainage of R given the PQ is 45m and the chainage of Q is 650m. [10]

3. a) What is traverse? How do you adjust traverse graphically? [6]

   b) The following data apply to a closed "link" traverse. Compute corrected bearings, angular misclosure. [10]

Station T_1	Measured angle (angle to the right)	Corrected bearings
		310°17'20"
A	272°40'00"	
B	267°27'28"	
C	87°02'31"	
D	109°35'39"	
E	270°29'59"	
		57°32'52"
T_2		

4. a) Explain with the help of neat sketch field procedure of two-peg test. [6]

   b) The following consecutive readings were taken with a level and 4 metre levelling staff on a continuously sloping ground at common interval of 30 metres.

   0.855 (on A), 1.545, 2.353, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 (on B).

   The R.L. of A was 380.500. Make a level book and apply usual checks. Determine the gradient of the line AB. [10]

5. a) Write temporary adjustments in a theodolite survey. [6]

   b) Explain with the help of neat sketch field method of measuring horizontal angle by i) repetition and ii) direction methods. [10]

***