TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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. 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: $\angle B = 93°06'50"$, $\angle C = 155°45'30"$, $\angle D = 247°09'40"$ and $\angle E = 90°58'20"$. 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]

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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 = 210x10³ 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]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

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 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]

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✓ Attempt *All* questions. -
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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]

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

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✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
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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 m² 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.
0.680, 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]

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05. TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Chaitra

Exam.		Regular	
Level	BE	Full Mark	80
Programme	BCE	Pass Mar	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**.
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1. a) Define surveying. Explain its importance for civil engineers. [4]

   b) Explain historical background of surveying and write basic principles of surveying. [4]

   c) A line was measured with a steel tape which was exactly 30 m at 20°C and at a pull of 10 kg, the measured length being 1860 m. The temperature during measurement was 35°C and the pull applied was 20 kg. Find the true length of the line, if the cross sectional area of the tape was 0.025 sq.cm. The co-efficient of expansion of the material of the tape per °C = 3.5×10^{-6} kg/sq.cm and the modulus of elasticity of material of the tape = 2.2×10^{6} kg/sq.cm. [8]

2. a) Explain the errors and adjustments in compass traversing. [4]

   b) Write the principle of electromagnetic distance measurement. [4]

   c) Following are the bearing observed in a compass traverse survey. At what station do you suspect local attraction? Find the correct bearing and true bearing of each of the lines given that magnetic declination was 3°30'E. [8]

Line	F.B	B.B
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) 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 circle reading	
		Face Left	Face Right
A	D	$90^0 00'00"$	$269^0 59'30"$
	B	$204^0 25'40"$	$24^0 25'30"$
B	A	$90^0 00'00"$	$270^0 00'30"$
	C	$190^0 36'10"$	$10^0 36'00"$
C	B	$90^0 00'00"$	$269^0 59'50"$
	D	$169^0 08'40"$	$349^0 09'20"$
D	C	$90^0 00'00"$	$270^0 00'00"$
	A	$165^0 12'40"$	$345^0 12'30"$

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 trilateration
   iv) Temporary adjustment of theodolite
   v)   Source of errors in leveling

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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

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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) 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 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 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 TBM₁ and TBM₂ 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

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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]

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05   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

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) Write the principle of chain surveying? Why well condition triangles are to be formed in chain surveying? [5]

   b) The area of a field is 45000 m². The length and breadth of the field on the map are 9cm×8cm respectively. Construct a diagonal scale which can be read up to one meter. Find the R.F of this scale. [5]

   c) A steel tape 20 m long weighs 0.50 kg and is used with supports at the ends only. A traverse leg is measured in four equal segments using a 4.00 kg pull and the length was recorded as 97.20m. What is the length of the line after sag correction? [6]

2. a) Explain orientation and intersection of plane table survey. [4]

   b) Describe the different methods of traverse plotting with sketch. [4]

   c) Calculate the bearings of lines of a closed traverse A, B, C, D, E and A from the following data. The correct fore bearings of line AB and BC are 250°15'00" and 199°45'00" respectively. The observed clockwise angle A, C, D and E are 29°15'00", 49°30'00", 63°15'00" and 268°45'00" respectively. Apply check and adjust the bearings if necessary. The least count of the instrument is 30'00". [8]

3. a) Describe about the three major principle of levelling. [6]

   b) The following staff readings were taken during a leveling operation at a common interval of 20 m. The respective staff readings are as follows: 1.253 m, 1.732 m, 1.005 m, 0.675 m, 1.998 m, 0.825 m, 1.737 m, 1.444 m, 1.619 m, 0.750 m and 2.619 m. The instrument is shifted after 4th, 6th and 9th reading and the R.L of first and last station are 1280.000 m and 1279.924 m respectively. Enter the above readings in a standard level format. Compute RL, apply the check and adjust the computed RL if necessary. [10]

4. a) Describe the principles of triangulation an trilateration. [4]

   b) Write in detail about personal error in theodolite surveying. [4]

   c) A direction theodolite is set over station 'O' to measure directions to stations A, B, C, D and A. The observed directions from that station are tabulated below: [8]

Inst.stn	Sighted stn.	HCR	Observation
		Face left	Face right
'O'	A	0°00'10"	179°59'30"
	B	99°54'20"	280°00'40"
	C	181°00'00"	0°59'20"
	D	295°20'30"	116°10'30"
	A	0°29'40"	179°29'20"

   Calculate the mean angles by the mean direction method and adjust them if necessary.

5. a) What is EDM? Explain principles of EDM. [5]

   b) Derive a formula for area calculation by simpson's one third rule. [5]

   c) The following perpendicular offsets were taken from a chain line to a irregular boundary. [6]

Chainage (m)	0.00	12.75	25.25	38.19	49.63	60.00
Offsets (m)	2.63	3.45	3.04	4.89	5.13	2.41

   Calculate the area by simple coordinate method.

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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) Define surveying. Explain its importance for civil Engineers with examples. [4]

   b) The area of a field is 50,000 m². The length and breadth of the field on the map are 10 cm and 8 cm. Construct a diagonal scale which can be read up to one meter. Find out R.F. of scale. [6]

   c) A baseline was measured in catenary at 10°C with a pull 5 kg in four segments 30.536, 29.635, 29,827 and 22.066 m. The difference of level was 0.30, 0.60, 0.20 and 0.45 m respectively. Calculate the length of base line if the tape was standardized as 30 m on the flat at 20°C with pull 15 kg. Density of tape materials = 7690 kg/m³, α = 0.000011 per °C, mass of tape per meter unit length = 20 gm E = 210×10³ N/mm². [6]

2. a) What are the different types of offsets and methods of taking offsets? [4]

   b) What is magnetic declination? Find the value of magnetic declination if the magnetic bearing of the Sun at noon is 356°. [4]

   c) Compute the corrected bearings from a closed compass survey ABCDEA. [8]

Line	AB	BC	CD	DE	EA
FB	140°30'	223°15'	287°00'	12°45'	60°00'
BB	322°30'	44°15'	107°45'	193°15'	239°00'

3. a) Explain the effect of curvature and refraction in leveling. Derive an expression for the curvature correction and refraction correction. The following consecutive staff readings were taken on a continuously sloping ground at 30 m intervals: -0.680, 1.855, 3.380, 3.830, 1.835, 2.250. 1st reading was taken on a B.M of R.L 435.982 m compute the R.L.s by rise and fall method and the gradient between B.M and last point. [4+4]

   b) Explain the temporary adjustment of level. A leveling instrument was set up exactly mid way between two pegs P and Q, 50 m apart. The staff readings on P and Q were 1.790 m and 1.895 m respectively. The instrument was shifted and set up at a distance of 5 m from Q on the line PQ produced. The staff readings taken were 1.563 m and 1.682 m at P and Q respectively. Compute the correct staff readings. [4+4]

4. a) Explain orientation by back sight in plane table survey. [4]
   b) Describe classification of EDM instrument. [4]
   c) Prepare a booking format of angle measurement between OA and OB by reiteration method including two sets and compute mean angle by FL and FR and mean direction method. [8]

5. a) Describe about measuring principle of electronic distance measurement. Compare these methods. [4]
   b) What is trilateration? Write the specification of first order triangulation. [4]
   c) A road embankment is 10 m wide at the formation level, with a side slope 1:1. The embankment has a rising gradient of 1 in 100 m. The existing ground level along the center line are as follows: [8]

Chainage (m)	0	100	200	300
Ground level (m)	503	498.50	504.50	502.50
Formation level (m)	500			

Compute the volume of Earthwork

***

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) Write the principles of surveying. [6]

   b) A steel tape standardized in catenary condition at 20°C temperature and 12 kg pull was found to be 29.985 cm. A line measured with this tape under a pull of 16 kg and at a mean temperature of 28°C was found to be 680 m long. Assuming that the tape is supported at every 20 m length. Find the true length of the line given that cross sectional area of tape = 0.03 cm^2, Young's modulus of elasticity, $E = 2.10 \times 10^6$ kg/cm^2, coefficient of linear expansion, $\alpha = 11 \times 10^{-6}$/°C and weight of tape = 10 gm/cc. [10]

2. a) Explain fore bearing, back bearing, Magnetic bearing and true bearing. [6]

   b) In a traverse survey following FB and BB were recorded at a place where local attraction was suspected. [10]

Lines	AB	BC	CD	DE	EA
FB	22°15'	39°30'	191°45'	330°15'	242°45'
BB	200°30'	222°30'	13°00'	147°45'	62°45'

   Find the correct bearings and included angles.

3. a) Explain reciprocal and precise leveling. [6]

   b) During fly leveling the following note is made: [10]
   BS: 0.62, 2.05, 1.42, 2.63 and 2.42 m
   FS: 2.44, 1.35, 0.53 and 2.41 m

   The first BS was taken on a BM of RL 1000.00m. From the last BS 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 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.

4. a) Explain Radiation and Intersection methods of plane table survey. [6]

   b) Compute the mean horizontal angles and adjust them if necessary: [10]

Inst.Station	Target Station	Horizontal circle Readings	
		F.L	F.R
O	A	00°00'20''	180°00'40''
	B	50°45'20''	230°45'30''
	C	140°50'55''	320°51'05''
	D	250°10'10''	70°10'00''

5. Write short notes on: (any two) [2×8]

   i) Trapezoidal and Simpon's 1/3 rule
   ii) Principle of electronic distance measurement
   iii) Principles of triangulation and trilateration
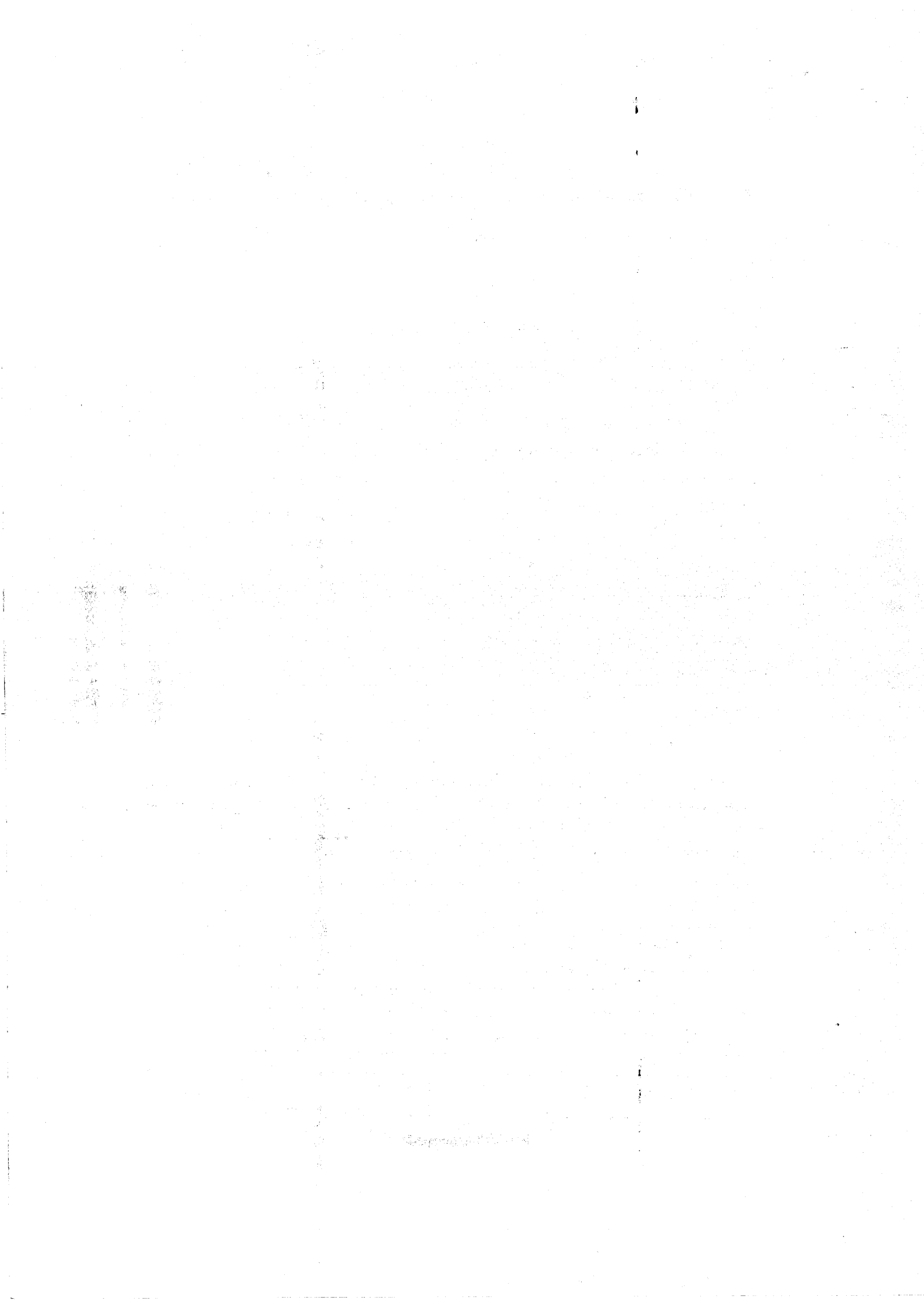
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Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	II / I	Time	3 hrs.

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) What are the principles of surveying? Explain clearly. [6]

   b) A steel tape 30 m long was standardized at 20°C with a pull of 10kg. A line was measured with this tape under the pull of 5 kg at a mean temperature of 32°C and found to be 2100m. The cross sectional area of tape is 0.03 cm². Young's modulus of elasticity of tape material is 2.1×10^6 kg/cm², α for steel is 12×10^{-5}/°C; the weight of tape is 0.693 kg. Determine the true distance measured and also find the normal tension if the measured length is equal to the true distance. [10]

2. a) Define whole circle bearing, quadrantal bearing, local attraction and magnetic declination. [6]

   b) The bearing observed in traversing with a compass at a place where local attraction was suspected are given below: [10]

Line	Fore bearing	Back bearing
AB	S 45°30'E	N 45°30'W
BC	S 60°00'E	N 60°40'W
CD	N 03°20'E	S 05°30' W
DA	S 85°00'W	N 83°30'E

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

3. a) Explain Crossection and Profile leveling with suitable sketches. [6]

   b) Following is the page of a level field book. Calculate the mission readings. [10]

Stations	BS	IS	FS	Rise	Fall	RL	Remarks
1	?					1150.00	BM
2		2.457			0.827	?	
3		2.400		0.057		?	
4	2.697		?		?	1148.070	CP
5	?		2.051	0.646		1148.716	CP
6		2.500		1.068		1149.784	
7		2.896			?	1149.388	
8		?			0.124	?	
9			2.672	0.348		1149.612	

4. a) Write the advantages and disadvantages of plane table survey. [4]

   b) Calculate the mean angle AOB by the mean direction method form the following data in a standard booking format: [6]

Inst.station	Target station	Face	HCR Observation Set I	HCR Observation Set II
0	A	L	00°00'00''	90°00'10''
	B	L	121°00'00''	211°00'40''
	B	R	301°00'20''	31°00'20''
	A	R	179°59'30''	269°59'40''

   c) Calculate the area of a closed traverse by double meridian distance method. [6]

   Line: AB   BC   CD   DA
   Latitude (m):   (-)300   (+)640   (+)100   (-)440
   Departure (m): (+)450   (+)110   (-)380   (-)180

5. Write short notes on: (any two)   [2×8]
   i)   Principles of triangulation and trilateration
   ii) Principles of chain survey
   iii) Principle of electronic distance measurement.

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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) What are the principles of surveying? Illustrate with suitable examples. [4]

   b) A distance of 20 m was set out with a 20 m tape from the top of station A to the top of station B. The tape being in catenary under a pull of 200 N and at a mean temperature of 31.25°C. The top of station A was 0.70 m above the top of station B. Calculate the exact horizontal distance between two stations, if the tape was standardised at a temperature of 20°C in catenary condition, under a pull of 100 N. Take $\alpha = 1\times10^{-5}$ per°C, Area of tape = 0.10 sq.cm, $E = 2\times10^5 N/mm^2$ and weight of the tape = 12 N. [8]

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

2. a) What are the advantages and disadvantages of plane table survey? Explain. [4]

   b) Define Triangulation and Trilateration. [4]

   c) Calculate the correct bearings of a link traverse XABCY from the following data: Bearing of lines XA = 292°15', and YC = 152°47'. Angles to the right $\angle A$ = 229°30', $\angle B$ = 323°45' and $\angle C$ = 27°15' [8]

3. a) List out the plotting method of compass traverse. What is the closing error and how closing error is adjusted graphically in compass traverse? [8]

   b) In running a fly levelling from a BM of RL 1400.602 m, the following readings were obtained. [8]
      BS : 1.543, 2.694, 1.416, 2.923 m
      FS : 0.754, 1.236, 0.596 m

   From the last position of the instrument, six pegs at 20 m interval are to be set out on a uniform rising gradient of 1 in 50, the 1st peg is to have a RL of 1404.000 m. Calculate the staff readings required to be set out the pegs and also the RLS of the pegs in a tabular format.

4. a) Describe about the field procedure of taking longitudinal sectioning and cross section. State its purpose and importance for new road construction project. [8]

   b) From a theodolite station O angle observation towards various stations are taken with referencing from P and then Q, R,S and again horizon is closed at P. The observed face left readings at P, Q, R, S and P are 00° 00' 00", 95°10'20", 205°32'30", 260°55'40" and 359°59'50" respectively. Similarly face right readings towards P, Q, R, S and P are 180°00'10", 275°10'00", 25°32'20", 80°55'20" and 179°59'40" respectively. Compile the above reading in a tabular form and compute the average angles, check and balance them if necessary. [8]

5. a) The formation width of a certain cutting is 10 m and side slope is 1:1. The surface of ground has a uniform slope of 1:7. The depths of cutting at the centers of the three sections 50 m apart are 2 m, 3 m and 4 m respectively. Find the volume using trapezoidal and simpson's rule. [8]

   b) Draw a longitudinal section and corresponding mass diagram showing free hand, over haul borrow, waste, balancing line, maxima and minima. [4]

   c) Write short notes about EDM. [4]

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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/cm³. The weight of suspended tape was 7.85 N. Take $E = 2.10 \times 10^5 N/mm^2$ and $\alpha = 12 \times 10^{-6}/°C$. 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

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06   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

| 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 0.081N/cm³, the weight of tape as 11.775N, E = 2.10 × 10⁵N/mm² and α = 11 ×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]
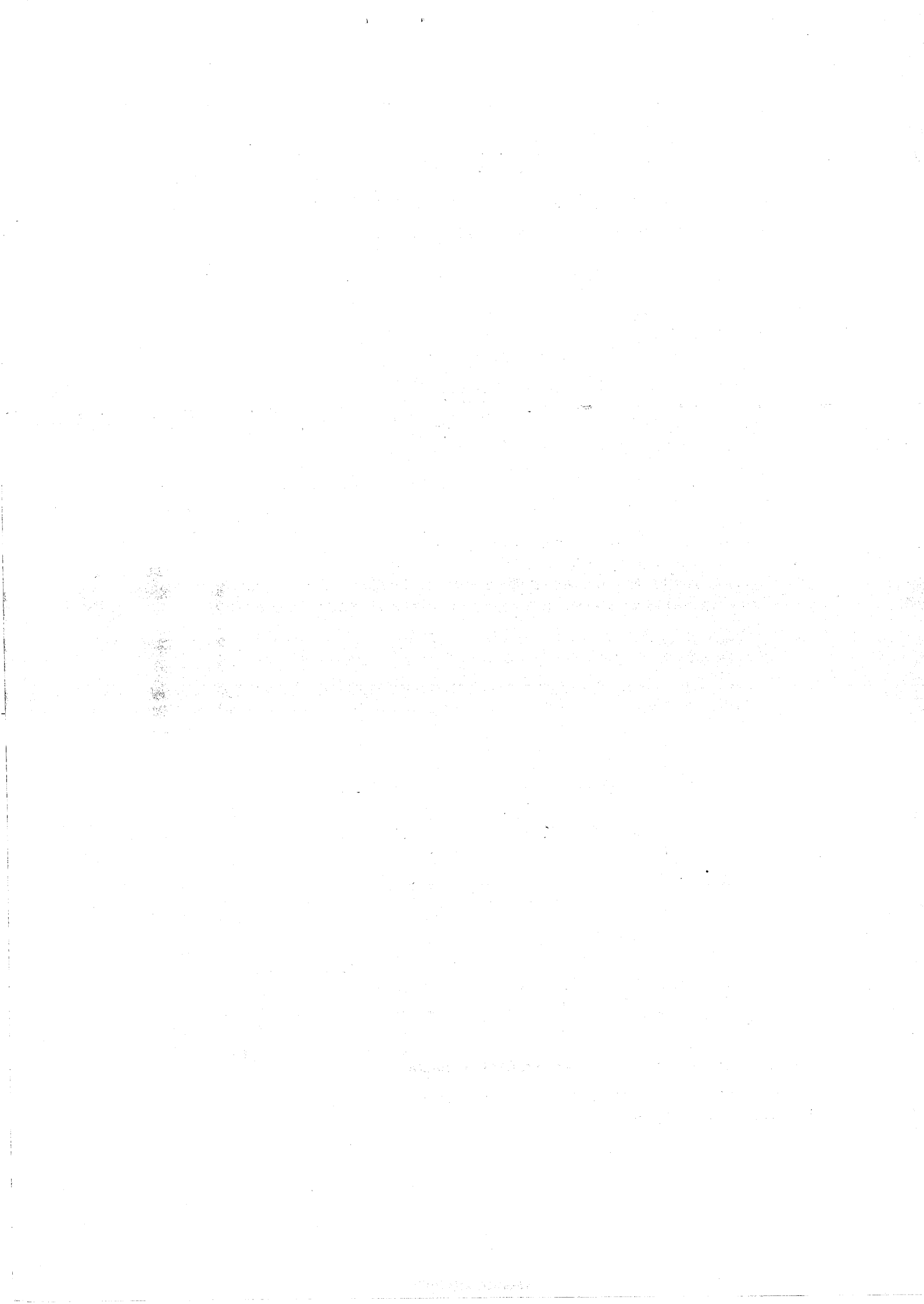
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Exam.	
Level	
Programme	
Year / Part	

	80
	32
	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 × 10^6 kg/sq.cm, α = 11 × 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]

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