Rajasthan Institute of Engineering & Technology, Jaipur

I Mid Term examination
Session: 2017-18 **Set-A**
IV Semester & CIVIL Branch
Subject :- SURVEYING I
Code :- 4CE4A

Time: 2 hrs. **M.M.:20**

Instruction for students:

1. No provision for supplementary answer book.

Q-1. Write Short note on :

1. Correction for temperature
2. Correction for absolute length
3. Correction for pull

Corrections for Pull

If pull applied while standardising the length of tape and pull applied in the field are different, this
correction is required.
Let, P0 = Standard pull
P = Pull applied in the field
A = Cross-sectional area of the tape
L = Measured length of line.
E = Young's modulus of the material of tape, then

$Cp = [(P- P)L] / AE$

The above expression takes care of sign of the correction also.

Correction for Temperature

Let T0 = Temperature at which tape is standardised
Tm = Mean temperature during measurement
α = Coefficient of thermal expansion of the material of the tape and
L = Measured length,
Then the temperature correction Ct is given by,
$Ct = L\alpha (Tm – T0)$
The above expression takes care of sign of the correction also.

Correction due to incorrect tape length

Manufacturers of measuring tapes do not usually guarantee the exact length of tapes, and standardization is a process where a standard temperature and tension are determined at which the tape is the exact length. The nominal length of tapes can be affected by physical imperfections, stretching or wear. Constant use of tapes cause wear, tapes can become kinked and may be improperly repaired when breaks occur.
The correction due to tape length is given by:

$$Cl = corr * Ml$$

Where:

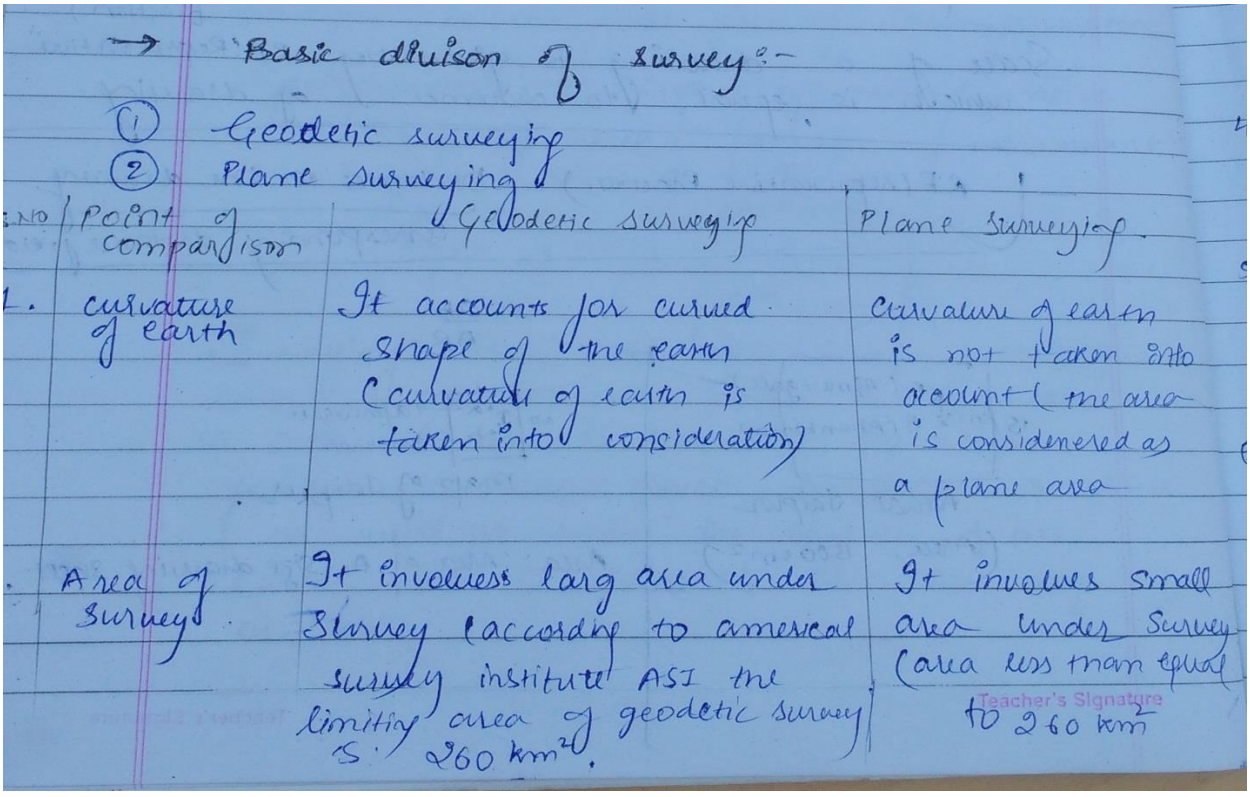
C_L is the corrected length of the line to be measured or laid out;

M_L is the measured length or length to be laid out;

N_L is the nominal length of the tape as specified by its mark;

OR

Q-1. What is Surveying and describe its classes ?

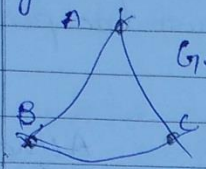
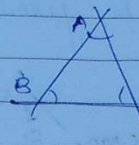


→ Basic division of survey:-

1. Geodetic surveying
2. Plane surveying

S.NO	Point of comparison	Geodetic surveying	Plane surveying
1.	curvature of earth	It accounts for curved shape of the earth (curvature of earth is taken into consideration)	Curvature of earth is not taken into account (the area is considered as a plane area
2.	Area of survey	It involves larg area under survey (according to americal survey institute ASI the limiting area of geodetic survey is 260 km²).	It involves small area under survey (area less than equal to 260 km²)

Teacher's Signature

	Geodetic Survey	Plane Survey
3. Frame work of Survey	the frame work consist of spherical triangles for which sum of internal angles are not equal to 180°. (actually greater than 180°)	The frame work consist of plane Δ the sum of interior angles of which is exactly equal to 180°.
	 Geoadectic survey frame work. ↓ spherical Δ ↓ ∠A + ∠B + ∠C [sum of interi angle] ≠ 180°. actually ∠A + ∠B + ∠C > 180	 Plane survey ↓ framework ↓ plane Δ ↓ Sum of interial Δ of angle of which 180°.
4. Type of instrument use	In this we It uses very precies instrument for surveying	less precies instrum. are use
5. Accuracy	It uses very accurate method of surveying	less accurate method can also be used in plane surveying
Feasibility	It requisedes more skiles, more cost and more time for the surveying.	It has less skiled labour, less labour and therefor overall less cost.

Q-2. What do you understand by chain and its types ?

Chains are the measuring instrument used in surveying formed by the 100 links of 4mm galvanized mild steel wire. These links are joined by 3 circular or oval wire rings. These rings provide the flexibility to the chains.

Types of Chains used in Surveying

Depending upon the length of the chain, these are divide into following types,

1. Metric chains
2. Steel band or Band chain
3. Gunter's chain or surveyor's chain
4. Engineer's chain
5. Revenue chain

A. Metric chains

Metric chains are the most commonly used chain in India. These types of chains comes in many lengths such as 5, 10, 20 and 30 meters. Most commonly used is 20m chain. Tallies are provided at every 2m of the chain for quick reading. Every link of this type of chain is 0.2m. The total length of the chain is marked on the brass handle at the ends.

B. Steel band or Band chain

These types of chain consist of a long narrow strip of steel of uniform width of 12 to 16 mm and thickness of 0.3 to 0.6 mm. this chain is divides by brass studs at every 20cm or instead of brass studs, band chain may have graduated engraving as centimeter.
For easy use and workability band chains are wound on steel crosses or metal reels from which they can be easily unrolled. These steel bands are available in 20m and 30m length and the width of about 12-16mm.

C. Gunter's chain or surveyor's chain

Gunter chain comes in standard 66ft. These chain consists of 100links, each link being 0.66ft or 7.92inches. The length 66ft is selected because it is convenient in land measurements.
0 square Gunter's chains = 1 Acre
10 Gunter chains = 1 Furlong
80 Gunter chains = 1 mile

D. Engineer's chain

This chain comes in 100ft length. Its consist of 100 links each link being 1ft long. At every 10 links a brass ring or tags are provided for indication of 10 links. Readings are taken in feet and decimal.

E. Revenue Chain

The standard size of this type of chain is 33ft. The number of links are 16, each link being 2 ft. This chain is commonly used in cadastral survey.

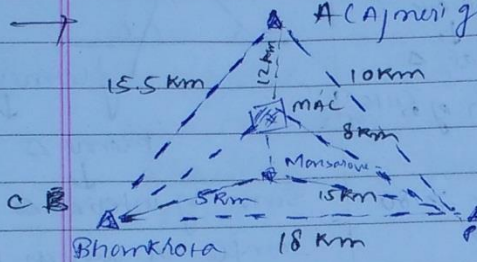
OR

Q-2. Explain Principal of surveying in detail

→ Principal of surveying :-

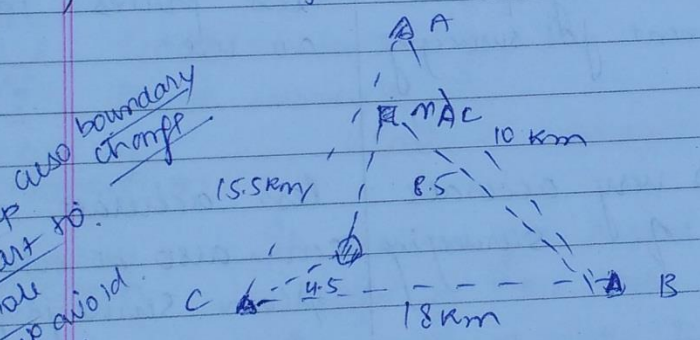
1. Always work from "whole to the part"
2. The position of new station, with reference to fixed & well defined points, should always be fixed by ~~two~~ two independent process.

→ A (Ajmer)



Actual graph.

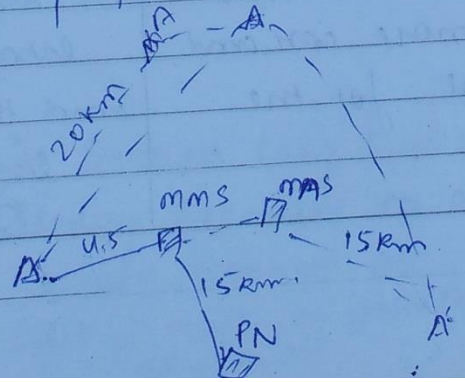
→ Working whole to part



Error also boundary change.
Add up in part to whole so we avoid this.

Localise Error

→ Working part to whole :-



Global error

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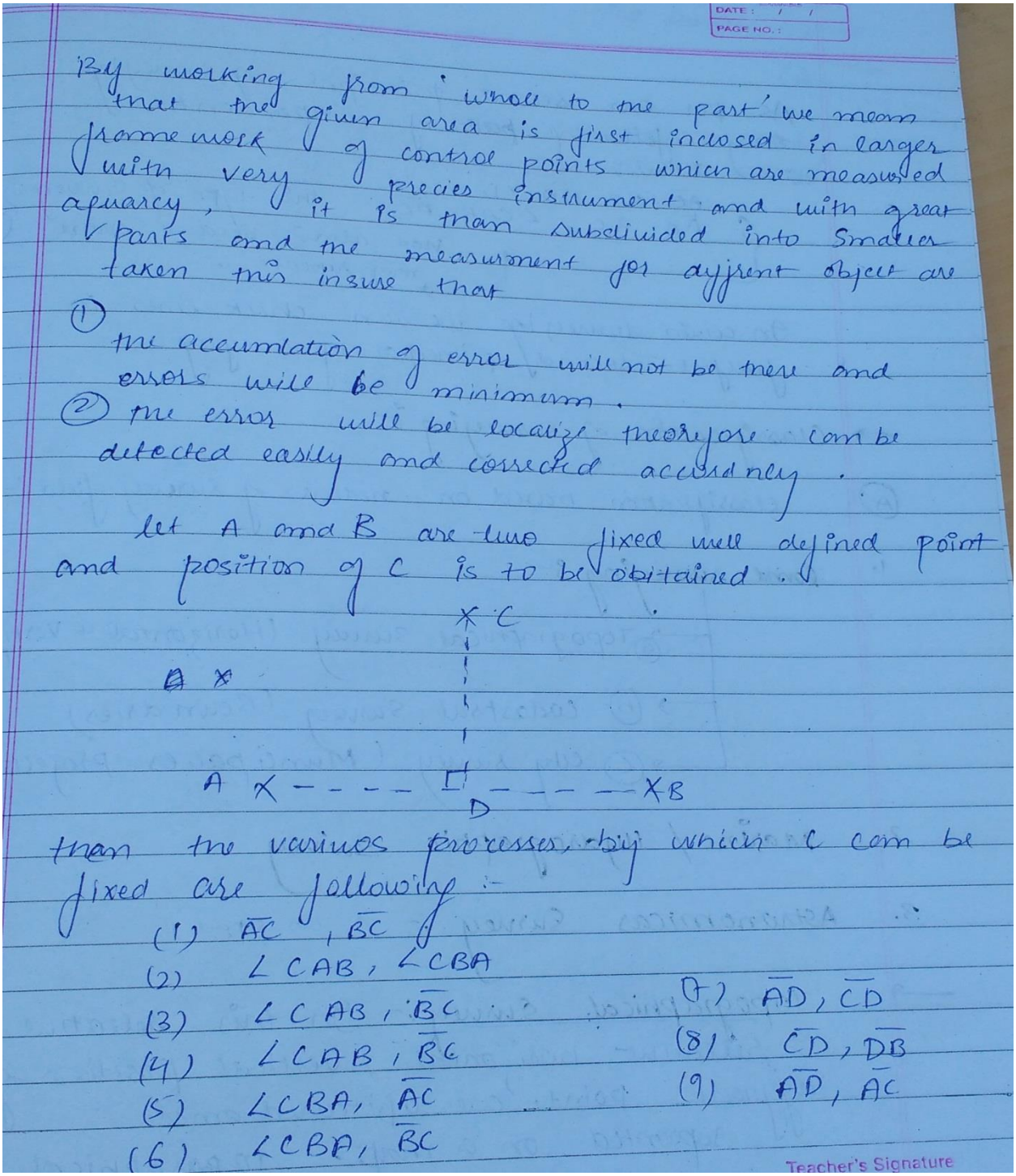

Q-3. Explain different types of chain error ?

Errors in chain Surveying

Errors in chaining may be classified as:

- Personal errors
- Compensating errors, and
- Cumulating errors.

Personal Errors

Wrong reading, wrong recording, reading from wrong end of chain
etc., are personal errors. These errors are serious errors and cannot be detected easily. Care should be taken to avoid such errors.

Compensating Errors

These errors may be sometimes positive and sometimes negative. Hence
They are likely to get compensated when large number of readings are taken. The magnitude of such errors can be estimated by theory of probability. The following are the examples of such errors:

- Incorrect marking of the end of a chain.
- Fractional part of chain may not be correct though total length is corrected.
- Graduations in tape may not be exactly same throughout.
- In the method of stepping while measuring sloping ground, plumbing may be crude.

Cumulative Errors

The errors that occur always in the same direction are called cumulative errors. In each reading the error may be small, but when large number of measurements are made they may be considerable, since the error is always on one side. Examples of such errors are:

1. Bad ranging
2. Bad straightening
3. Erroneous length of chain
4. Temperature variation
5. Variation in applied pull
6. Non-horizontality
7. Sag in the chain, if suspended for measuring horizontal distance on a sloping ground.

Errors (i), (ii), (vi) and (vii) are always +ve since they make measured length more than actual.

OR

Q-3 Describe correction to measurement in actual length

Correction due to incorrect tape length

Manufacturers of measuring tapes do not usually guarantee the exact length of tapes, and standardization is a process where a standard temperature and tension are determined at which the tape is the exact length. The nominal length of tapes can be affected by physical imperfections, stretching or wear. Constant use of tapes cause wear, tapes can become kinked and may be improperly repaired when breaks occur.
The correction due to tape length is given by:

$$Cl = corr * Ml$$

Where:

$\mathbf{C_L}$ is the corrected length of the line to be measured or laid out;

$\mathbf{M_L}$ is the measured length or length to be laid out;

$\mathbf{N_L}$ is the nominal length of the tape as specified by its mark;

Q-4. A steel tape 20 m long standardized at 55° F with a pull of 10 kg find the correction per tape length if the temperature at the time of measurement was 80° F and pull was 16 kg wt. of 1 cubic centimeter =7.86 g wt of tape = 0.8 kg and E =2.10 X 10^6 kg/cm2 α = 6.2 x 10^ -6

W = wt. of taper per span length

$= 78.6 \times 10 \times (8 \times 10^{-6})$

$= 6288 \times 10^{-6}$ kN = 6.288 N

[*Note:* $1\ mm^2 = (0.001)^2\ m^2 = 1 \times 10^{-6}\ m^2$]

P = 80 N L = 10 m

∴ Correction for each span

$$= \frac{1}{24}\left(\frac{6.288}{80}\right)^2 \times 10$$

$= 2.574 \times 10^{-3}$ m

∴ **Correction for three spans**

$= 3 \times 2.574 \times 10^{-3}$ m

$= 7.722 \times 10^{-3}$ m **Ans.**

OR

Q-4. Describe the correction for sag in detail ?

correction for Sag

While measuring on unevenly sloping ground, tapes are suspended at shorter length and horizontal

distances are measured. This technique eliminates errors due to measurement along slopes, but necessitates correction for sag [Fig. 12.23]. Hence, measured length is more than actual length. Thus the correction is –ve. The correction, which is difference between the length of catenary and true length is given by

Cs = 1 / 24 (W/P)^2 L

where,

W = the weight of the tape of span length

P = the pull applied and L = measured length

It may be noted that if pull is more than standard pull, the correction for pull is +ve, while correction for sag is always –ve. The pull for which these two corrections neutralise each other is called 'normal tension'. Hence normal tension Pn may be found as,

Cp = Cs

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I Mid Term examination
Session: 2017-18 **Set-B**
IV Semester & CIVIL Branch
Subject :- SURVEYING I
Code :- 4CE4A

Time: 2 hrs. **M.M.:20**

Instruction for students:

1. No provision for supplementary answer book.

Q.1 Write Short note on :

1. Correction for Tension
2. Correction for temperature
3. Correction for slope

Corrections for Pull

If pull applied while standardising the length of tape and pull applied in the field are different, this
correction is required.
Let, P0 = Standard pull
P = Pull applied in the field
A = Cross-sectional area of the tape
L = Measured length of line.
E = Young's modulus of the material of tape, then

$Cp = [(P- P)L] / AE$

The above expression takes care of sign of the correction also.

Correction for Temperature
Let T0 = Temperature at which tape is standardised
Tm = Mean temperature during measurement
α = Coefficient of thermal expansion of the material of the tape and
L = Measured length,
Then the temperature correction Ct is given by,
$Ct = L\alpha (Tm – T0)$
The above expression takes care of sign of the correction also.

OR

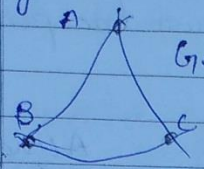
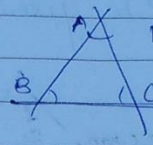
Q.1 What do you understand by plane and geodetic surveying ?

→ Basic division of survey:-

(1) Geodetic surveying
(2) Plane surveying

S.NO	Point of comparison	Geodetic surveying	Plane surveying
1.	curvature of earth	It accounts for curved shape of the earth (curvature of earth is taken into consideration)	Curvature of earth is not taken into account (the area is considered as a plane area
2.	Area of survey	It involves larg area under survey (according to americal survey institute ASI the limiting area of geodetic survey is 260 km^2.	It involves small area under survey (area less than equal to 260 km^2

Teacher's Signature

	Geodetic Survey	Plane Survey
3. Frame work of Survey	the frame work consist of spherical triangles for which sum of internal angles are not equal to 180°. (actually greater than 180°)	The frame work consist of plane Δ the sum of interior angles of which is exactly equal to 180°.
	 Geoadectic survey frame work. ↓ spherical Δ ↓ $\angle A + \angle B + \angle C$ [sum of interior angle] $\neq 180°$. actually $\angle A + \angle B + \angle C > 180$	 Plane survey ↓ frame work ↓ plane Δ ↓ Sum of interior Δ of angle of which 180°.
4. Type of instrument use	In this we It uses very precies instrument for surveying	less precies instrum. are use
5. Accuracy	It uses very accurate method of surveying	less accurate method can also be used in plane surveying
Feasibility	It requisedes more skiles, more cost and more time for the surveying.	It has less skilled labour, less labour and therefor overall less cost.

Q.2 Write short note on :

1. Gunter's Chain
2. Metric Chain
3. Revenue chain
4. Chain length and link length

1. Gunter's chain or surveyor's chain

Gunter chain comes in standard 66ft. These chain consists of 100links, each link being 0.66ft or 7.92inches. The length 66ft is selected because it is convenient in land measurements.

0 square Gunter's chains = 1 Acre
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2. Metric chains

Metric chains are the most commonly used chain in India. These types of chains comes in many lengths such as 5, 10, 20 and 30 meters. Most commonly used is 20m chain. Tallies are provided at every 2m of the chain for quick reading. Every link of this type of chain is 0.2m. The total length of the chain is marked on the brass handle at the ends

3. Revenue Chain

The standard size of this type of chain is 33ft. The number of links are 16, each link being 2 ft. This chain is commonly used in cadastral survey.

OR

Q.2 Explain Types of tapes ?

1. Cloth or linen tape

- Used for subsidiary measurements
- Very light, easy to handle
- May effect by moisture

2. Metric steel tape

- Made of steel
- Outer end is provided with a ring for holding

3. Invar tape

- Used for high precision work
- Made of alloy steel

4. Synthetic tape

- Made of glass fiber with PVC coating
- These are used for short measurements

Q.3 Explain Sag correction stating when this is applied ?

correction for Sag

While measuring on unevenly sloping ground, tapes are suspended at shorter length and horizontal
distances are measured. This technique eliminates errors due to measurement along slopes, but necessitates correction for sag [Fig. 12.23]. Hence, measured length is more than actual length. Thus the correction is –ve. The correction, which is difference between the length of catenary and true length is given by

$Cs = 1 / 24 (W/P)^2 L$

where,

W = the weight of the tape of span length

P = the pull applied and L = measured length

It may be noted that if pull is more than standard pull, the correction for pull is +ve, while correction for sag is always –ve. The pull for which these two corrections neutralise each other is called 'normal tension'. Hence normal tension Pn may be found as,

$Cp = Cs$

OR

Q.3 Enumerate various classification of surveying ?

Based on the purpose (for which surveying is being conducted), Surveying has been classified into:

- **Control surveying :** To establish horizontal and vertical positions of control points.

- **Land surveying :** To determine the boundaries and areas of parcels of land, also known as property survey, boundary survey or cadastral survey.

- **Topographic survey :** To prepare a plan/ map of a region which includes natural as well as and man-made features including elevation.

- **Engineering survey :** To collect requisite data for planning, design and execution of engineering projects. Three broad steps are

1) Reconnaissance survey : To explore site conditions and availability of infrastructures.

2) Preliminary survey : To collect adequate data to prepare plan / map of area to be used for planning and design.

3) Location survey : To set out work on the ground for actual construction / execution of the project.

- **Route survey :** To plan, design, and laying out of route such as highways, railways, canals, pipelines, and other linear projects.

- **Construction surveys :** Surveys which are required for establishment of points, lines, grades, and for staking out engineering works (after the plans have been prepared and the structural design has been done).

• **Astronomic surveys :** To determine the latitude, longitude (of the observation station) and azimuth (of a line through observation station) from astronomical observation.

• **Mine surveys :** To carry out surveying specific for opencast and underground mining purposes.

Q.4 Calculate the sag correction for a 30 m steel under a pull of 100 N in three equal spans of 10 m each Wt. of tape = 0.078/ cum Area of tape = 0.08 sq. cm

W = wt. of taper per span length

$= 78.6 \times 10 \times (8 \times 10^{-6})$

$= 6288 \times 10^{-6}$ kN = 6.288 N

[*Note:* 1 $mm^2 = (0.001)^2$ $m^2 = 1 \times 10^{-6}$ m^2]

P = 80 N L = 10 m

∴ Correction for each span

$$= \frac{1}{24}\left(\frac{6.288}{80}\right)^2 \times 10$$

$= 2.574 \times 10^{-3}$ m

∴ **Correction for three spans**

$= 3 \times 2.574 \times 10^{-3}$ m

$= \mathbf{7.722 \times 10^{-3}}$ **m Ans.**

OR

Q4. A tape 20 m long standardized length at 84° F was used to measure a line the mean temperature during measurement being 65° The measured distance was 882.10 m The following being the slopes

2°10’ for 100 m

4° 12’ for 150 m

1°6’ for 50 m

Find the length if coefficient of expansion is 65x10^-7 per 1°F

Solution: Measured horizontal distance = $\Sigma L \cos\theta$

$= 125 \cos 2° 18' + 250 \cos 3° 30' + 170 \cos 1° 42'$

$= 544.367$ m

Temperature correction

$C_t = L\alpha (T_m - T_0)$

$= 544.367 \times 6.2 \times 10^{-6} (65 - 80)$

$= -0.051$ m

Correct horizontal length

$= 544.367 - 0.051 =$ **544.316 m Ans.**