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Internal Assesment Test –2

Sub: Surveying				Code: 18CV35
Date:15/10/2019	Duration: 90 mins	Max Marks: 50	Sem: IV	Sections:CV (A & B)

Answer ***any five*** questions. Good luck!

		Marks	OBE CO	OBE RBT
1	Discuss the reciprocal ranging of Surveying.	10	[illegible]	[illegible]
2	Discuss the different errors due to incorrect chain or tape.	10	[illegible]	[illegible]
3.	The length of a Survey line was measured with a 20m tape and was found to be 1200m. As a check, the length was again measured by a 25m tape and was found to be 1212m. On comparing the 20m tape with a test gauge, it was found to be 20 centimeter too short. Find the actual length of the 25m tape used.	10	[illegible]	[illegible]
4.	Discuss the various tape corrections in surveying.	10	[illegible]	[illegible]

P.T.O

		Marks	OBE	
			CO	RBT
5	Explain the different methods of obstacles to chaining but not ranging.	10	4	L1 L2
6.	In passing through an obstacle in the form of a pond, stations A & D on the main line were taken on the opposite sides of a pond. On the left of AD, a line AB 500m long was laid and a second line AC 800m long was ranged on the right side of AD such that the points B, D&C are to be in a straight line. Distances BD & DC were chained and found to be 200m and 400m respectively. Find the true length of AD.	10	4	L1 L2
7.	A steel tape was standardized at 95°C with a pull of 40 Kg to measure a base line. Find the correction per tape length of 30m if the temperature at the time of measurement was 45°Cand the pull exerted was 20 Kg. The unit weight of steel was 7860Kg/m^3, the total weight of tape was 1.80 Kg with Young's modulus of elasticity as 2.20x 10^6 Kg/cm^2. Take the coefficient of thermal expansion as 6.2x10^{-6} /°C.	10	1, 4	L1

C.I. 8/10/19 C.C.I. H.O.D. 3/10/19

SURVEYING IAT-02 SOLUTIONS.

01. The length of a survey line was measured with a 20m tape and was found to be 1200m. As a check, the length was again measured by a 25m tape and was found to be 1212m. On comparing the 20m tape with a test gauge, it was found to be 20cm too short. Find the actual length of the 25m tape used.

Solution :

Step (1) : To find the measured length using 20m chain/tape

Given : $l' = 1200m$

$L = 20m$

$L' = (20 - 0.2) = 19.8m$

$l = ?$

$$\therefore \quad l = l'\left(\frac{L'}{L}\right)$$

$$= 1200\left(\frac{19.8}{20}\right)$$

$$\underline{l = 1188m}.$$

05M

Step (2) : To find the measured length using 25m tape

Given : l = actual measured length = 1188m

$l' = 1212m$

$L = 25m$

$L' = ?$

$$\therefore \quad l = l'\left(\frac{L'}{L}\right)$$

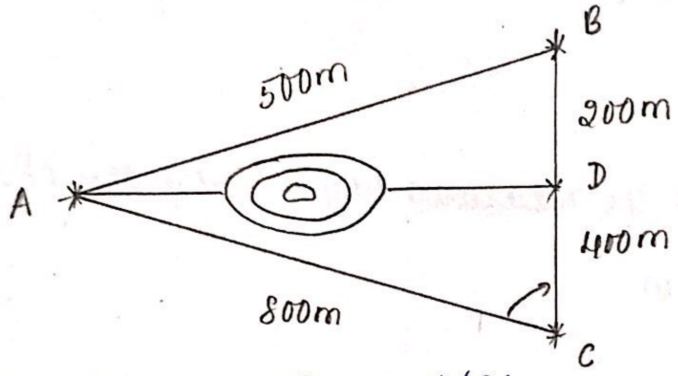
$$L' = \frac{25 \times 1188}{1212}$$

$$\underline{\underline{L' = 24.50m}}$$

$\therefore$ The 25m length tape was too short by 0.5m

05M

02. In passing through an obstacle in the form of a pond stations, A and D on the main line were taken on the opposite sides of a pond. On the left of AD, a line AB 500m long was laid and a second line AC 800m long was ranged on the right side of AD such that the points B, D & C are to be in a straight line. Distances BD & DC were chained and found to be 200m and 400m respectively. Find the true length of AD.



Step ①: To find the vertex angle 'θ'

apply Cosine rule to Δ^{le} ABC,

$$AB^2 = BC^2 + CA^2 - 2BC \cdot CA \cos\theta$$

$$\cos\theta = \frac{-AB^2 + BC^2 + CA^2}{2BC \cdot CA}$$

$$= \frac{-(500)^2 + (600)^2 + (800)^2}{2(600)(800)}$$

$$\cos\theta = 0.7813$$

05M

Step ②: To find the obstructed length AD,

In Δ^{le} ADC,

$$AD^2 = DC^2 + CA^2 - 2DC \cdot CA \cos\theta$$

$$= (400)^2 + (800)^2 - 2(400)(800)(0.7813)$$

$$AD^2 = 299968$$

$$AD = 547.7 \text{ m}.$$

05M

03. A steel tape was standardized at 95°C with a pull of 40 kg to measure a base line. Find the correction per tape length of 30 m if the temperature at the time of measurement was 45°C and the pull exerted was 20 kg. The unit weight of steel was 7860 kg/m³, the total weight of tape was 1·80 kg with Young's modulus of elasticity as $2 \cdot 20 \times 10^6$ kg/cm². Take the Co-efficient of thermal expansion as $6 \cdot 2 \times 10^{-6}/°C$.

Given: $P = 40kg$ $\alpha = 6 \cdot 2 \times 10^{-6}/°C$

$P_0 = 20kg$ $T_m = 45°C$

$L = 30m$ $T_0 = 95°C$

$E = 2 \cdot 2 \times 10^6 \times 10^4 \ kg/m^2$

Step ①: Correction for temperature.

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

$$= 6 \cdot 2 \times 10^{-6} (45 - 95) 30$$

$$C_T = -0.0093m \quad \cdots ①$$

$$A = \frac{m}{\delta L} = \frac{1 \cdot 8}{7860 \times 30}$$

$$A = 7 \cdot 63 \times 10^{-6} m^2$$

Step ②: Correction for pull,

$$C_p = \frac{(P - P_0) L}{AE} = \frac{(20 - 40) \times 30}{7 \cdot 63 \times 10^{-6} \times 2 \cdot 2 \times 10^{10} \ kg/m^2}$$

$$= -3 \cdot 57 \times 10^{-3} m \quad \cdots ②$$

Step ③: Correction for sag.

$$C_s = \frac{n \times l_1 (w l_1)^2}{24 P^2} = \frac{1 \times 30 (0 \cdot 06 \times 30)^2}{24 (20)^2}$$

$$= -0 \cdot 0101m \quad \cdots ③$$

Total correction $= C_s + C_p + C_t = -0 \cdot 0093 - 0 \cdot 0035 - 0 \cdot 0101$

$$= -0 \cdot 1138 \ m$$

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04. Discuss the different errors due to incorrect Chain or tape

Let 'L' = True length of Chain or tape

L' = Incorrect length of Chain (or) tape used

l' = field measurement

l = final corrected length. (01 M)

Correction to length:

$$\boxed{l = l'\left(\frac{L'}{L}\right)}$$

(03M)

Correction to Area:

Let A' = measured area of the ground

a = Corrected area of the ground

Corrected area, $\boxed{a = A'\left(\frac{L'}{L}\right)^2}$ (03M)

Correction to volume:

Let V' = measured volume in the field

V = corrected volume of the field

Corrected volume, $\boxed{V = V'\left(\frac{L'}{L}\right)^3}$ (03 M)

05. Discuss the various tape corrections in surveying

(1) Correction for standardization:

$$\boxed{C_a = \frac{L}{l} \times t}$$

where, C_a = Correction for absolute length

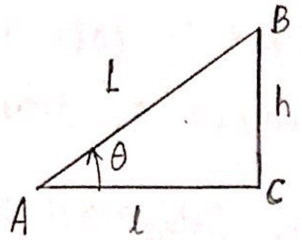
L = measured length of line

t = correction per Chain length

l = designated length of Chain or tape.

(2) Correction for slope, bad alignment bad ranging :

$$\boxed{C = \frac{h^2}{2L}}$$



$C = L(1 - \cos\theta)$

This will be always -ve

(3) Correction for temperature :

It is given by, $\boxed{C_t = \alpha (T_m - T_0) L}$

where, α = Co-efficient of thermal expansion

T_m = mean temperature in the field during measuremen

T_0 = Standard temperature of the tape

L = measured length.

(4) Correction for pull or tension:

It is given by, $\boxed{C_P = \frac{(P - P_0) * L}{AE}}$

Where, P = Pull applied during measurement Kg or N

P_0 = standard pull Kg or N

l = measured length

A = C/S area of tape in cm^2 or mm^2

E = Young's modulus of elasticity in Kg/cm^2 or N/mm^2

(5) Correction for Sag:

This correction will be always Negative

It is given by, $\boxed{C_S = n * \frac{l_1 (Wl_1)^2}{24P^2}}$

where, l_1 = length of the tape (in m) suspended betn the supports

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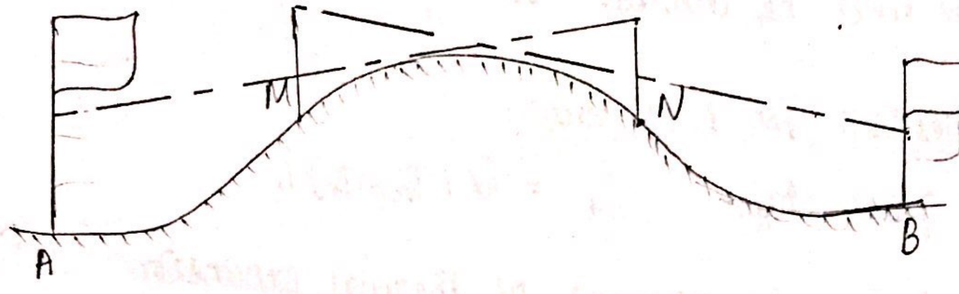
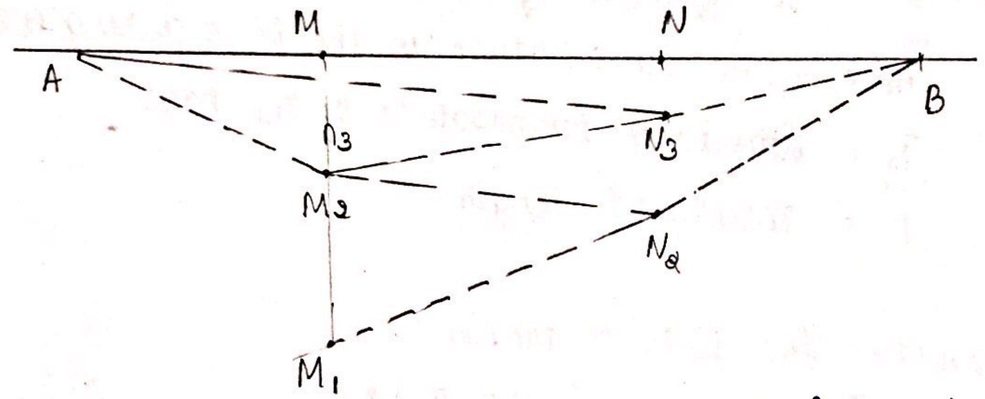
P = applied pull in Kg or N

ω = weight of tape (in kg or N) per meter

n = number of spans

06. Discuss the reciprocal ranging of Surveying





03M

Indirect or reciprocal ranging is resorted to when both the ends of the survey line are not intervisible due to high intervening ground or due to longer distance between them.

In such a case, ranging is done indirectly by selecting two intermediate points M_1 and N_1 very near to the survey line by eye judgement in such a way that M_1 and N_1 are intervisible. Further M_1 and N_1 must be such that from N_1 both M_1 and A are visible.

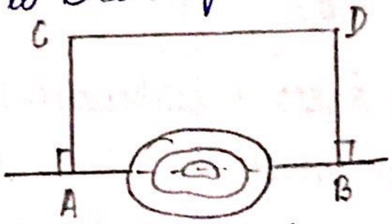
The procedure is as follows:

- Two surveyors station themselves at M_1 and N_1 with ranging rods.

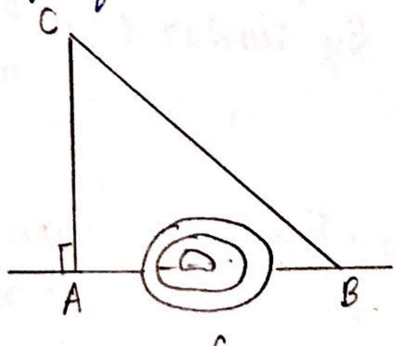
04M

- The person at M_1 then directs the person at N_1 to move to a new position N_2 in line with M_1B such that $M_1 N_2 B$ are in straight line.
- The person at N_2, then directs the person at M_1 to move to a new position M_2 in line with N_2A such that $N_2 M_2 A$ are in straight line.
- The process is repeated till the points M and N are located in such a way that the person at M finds the person at N in line with MB and the person at N finds the person at M in line with N_A. After having established M and N, other points can be fixed by direct ranging. 03M

07. Explain the different methods of obstacles to chaining but not ranging.



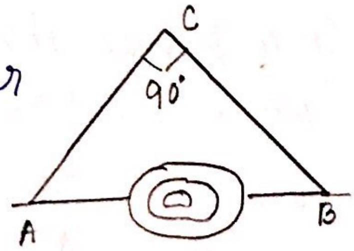
(i) In this method, select two points A and B on either side. set out equal perpendiculars AC and BD. Measure CD. Now, by property of Δ^{le}, AB = CD 02M



(ii) In this method, draw AC as $\perp^{er}$ to AB and measure AC. Also, measure BC.

By pythagoras theorem,

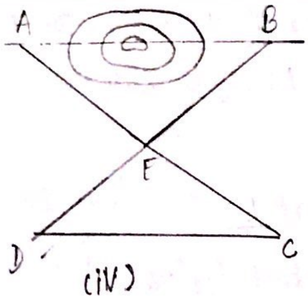
$$BC^2 = AC^2 + AB^2 \Rightarrow AB = \sqrt{BC^2 - AC^2}$$



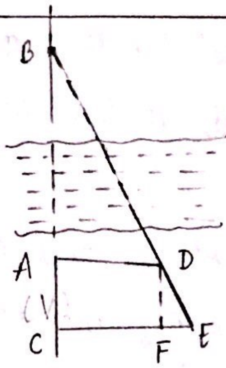
(iii) In this method, Erect AC as perpendicular to BC. Measure AC and BC. 04M

$$AB = \sqrt{(AC)^2 + (BC)^2}$$

(iv) Select any suitable point E and measure AE and BE. Range a point C in line with AE such that AE = EC. Similarly range a point D in line with BE such that BE = ED. measure CD.
Now AB = CD



(IV)



(V)

(V) Select the point B on one side with A & C on the other side. Erect AD and CE as perpendiculars to AB and BC respectively. such that B, D and E are in a straight line. Measure AC, AD, CE.

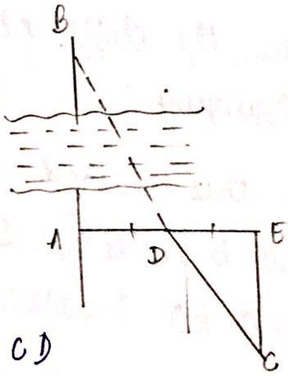
Draw DF as $\perp^{er}$ to CE.

Δ^{les} BDA and DFE are similar

$\therefore \frac{AB}{DF} = \frac{AD}{FE} \Rightarrow AB = \frac{AD * DF}{FE} = \frac{AD * AC}{CE \cdot AD}$

02M

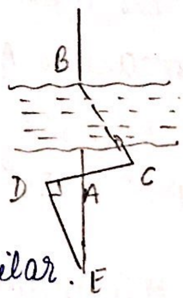
(vi) Erect a perpendicular AC to the line AB and bisect it at D. At C, draw CE $\perp^{er}$ to AC, such that the line BDE will be a straight line.



By similar Δ^s, $\frac{BA}{AD} = \frac{CE}{CD} = \frac{CE}{AD}$ $\because AD = CD$

$\Rightarrow BA = CE$

(vii) Fix point & such that AC is $\perp^{er}$ to BC.



$\therefore$ BAC is a right angled Δ^{le} at C. prolong CA to D such that CA = AD.

Δ^{les} BAC = DAE are equiangular and similar.

Now, $\frac{BC}{AC} = \frac{DE}{AD} = \frac{AB}{DE} \Rightarrow \frac{BC}{DE} = \frac{AC}{AD} = \frac{AB}{AE}$

$\Rightarrow AB = AE$ $\because AC = AD$.

02M

End of scheme.