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Describe the following

i) Objective of Hydrographic Surveying.

Measurement of tides for sea coasts i.e
Construction of the sea defense works, harbours
etc

ii) Determination of the bed depth by Sounding

For navigation

- Location of rock, sand bar, buoys, navigation light etc

- For location of ~~rock~~, the under water works, volume of the under water excavation etc

- In connection with irrigation and land drainage scheme

iii) Determination of direction of current in connection with

- Location of sewer out fall
- Determination of the area subjected to silt and scour
- For reg navigation process

(v) Measurement of quantity of water and flow of water in connection with water scheme, power scheme, flood control etc.

Classification of leveling:-

Differential leveling:-

It is the operation of leveling to determine the elevation of point some distance apart or to establish "B.M" the process is same as that in continuous or compound leveling.

Checking leveling:-

It is the operation of running levels for the purpose of checking a series of

From vertical angles and horizontal distance measured in the field.

Equipment for making Sounding

Lead line:

Lead lines are also called sounding lines are used for depth over about "6m (20 ft)". It consists of suitable length of stretch resistance cord or other material to which a heavy lead weight 5 to 10 lb is attached.

The cord is marked with feet or meter graduation and there should be checked frequently against a steel tape, for their accuracy.

In use the weight is lowered into the water being careful to keep the cord vertical. The graduation at the structure is read when the weight hits bottom.

Profile leveling:- It is the operation in which the object is to determine the elevation of point at known distance apart along a given line also called longitudinal leveling or sectioning.

Cross-Sectioning:- It is the method of leveling to determine the surface undulations or the outline of the ground transverse to the given line and on either side of it.

Barometric leveling:- It is the method of leveling in which the altitudes of points are determined by means of a barometer, which measures the atmospheric pressure.

Hypsometric leveling:- It is the method of leveling in which the ~~high~~ height of mountains are found by observing the temperature at which water boils.

Trigonometrical leveling:- It is the process of leveling in which the elevations points are computed

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The chain should be tested periodically

Sounding lead:-

The weight attached to the lead line conical in shape and varies from 2.5 kg to 12.5 kg depending upon the depth of water and the strength of the water currents

The shallow still water weight equal to "2.5 kg"

Moderate depth upto 10m (40 f) weight is equal to 5kg

Sounding Machine:-

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Two dials, the outer one indicated the depth in m and an inner one is tenth of a meter.

at 10m intervals from a survey line to an irregular boundary line 2.82, 3.37, 5.82, 4.26, 6.59, 7.90, 8.52, 7.42, 5.43m. Calculate the area enclosed between the survey line, irregular boundary line and last offset by

A) Simpson's rule B) Trapezoidal Rule C) Average ordinate rule

By Using Average ordinate Rule

Interval between offsets = $d = 10\text{m}$

No of Interval = $n = 8$

No of offset = $n + 1 = 9$

length of survey line = $l = n \times d = 8 \times 10 = 80\text{m}$

Area = $A = (O_0 + O_1 + O_2 + \dots + O_n) \times l / (n + 1)$

$2.82 + 3.37 + 4.26 + 7.90 + 7.42 + 5.82 + 6.59 +$
 $8.52 + 6.43) \times 80 / 9$

53.13×8.88

472.09 Sq. m

By Trapezoidal rule.

2.82, 3.37, 5.82, 4.26, 6.59,
7.90, 8.52, 7.42, 5.43m

$$\begin{aligned} \text{Area} &= A d / 3 \{ (O_0 + 2 \times (O_1 + O_2 + O_3 + \dots + 2 \times (O_{n-1}) + O_n)) \} \\ &= 10/3 (2.82 + 2 \times (3.37 + 4.26 + 7.90 + 7.42) + 2 \times (5.82 + \\ &+ 6.59 + 8.52) + 5.43) \\ &= 3.33 (2.82 + 2 \times (28.95) + 2 \times (20.43) + 5.43) \\ &= 3.33 (2.82 + 45.9 + 47.29) \\ &= 3.33 \times 96.01 \Rightarrow 320.01 \text{ Sq. m} \end{aligned}$$

By Simpson's rule

$$\text{Area} = A = d/3 (O_0 + 4 \times O_1 + 2 \times O_2 + 4 \times O_3 + \dots + 2 \times O_{n-2} + 4 \times O_{n-1} + O_n)$$

$$\text{Area} = 10/3 (2.82 + 4 \times (3.37 + 4.26 + 7.90 + 7.42) + 2 \times (5.82 + 6.59 + 8.52) + 5.43)$$

$$= 3.33 (2.82 + 91.8) + (41.86) + 5.43$$

$$(94.62) + (47.29)$$

$$\text{Area} = 473.06 \text{ Sq. m}$$

AD and AC intersect at a ch

of a chainage of 4848m. The angle of intersection is 140° it is required to set out 5° curve to connect the straights. Calculate all the data necessary to set out the curve by method of offsets from the chord produced. Peg interval is 30 mm.

The chain used is of 30 mm

Radius of the curve, $R = 1780 / 0.05 = 34400$ m

Deflection angle, $\Delta = 180 - 140 = 40^\circ$

Tangent length = $R \tan(\Delta/2) = 34400 \tan 20^\circ = 12559$ m

Chainage of intersection point B = 4848 m

Chainage of $T_1 = (4848 - 12559) = 4116.8$ m

Length of curve = $R \Delta \pi / 180 = 240.16$ m

Chainage of $T_2 =$ Chainage of $T_1 +$ length of curve
 $= 4116.8 + 240.16 = 4356.96$ m

Length of the chords

First sub-chord, $C_1 = 4140 - 4116.8 = 23.2$ m

The last sub-chord, $C_n = 4356.96 - 4350 = 6.96$ m

These are seven unit chords of 30mm length
 Hence, there will be nine chords altogether

The o^{th} set curve

$$O_1 = \frac{C_1^2}{2R} = \frac{23 \cdot 2^2}{2 \times 344}$$

$$O_n = \frac{C_n(C_{n-1} + C_n)}{2R}$$

$$O_9 = \frac{30(23 \cdot 2 + 30)}{2 \times 344} = 2.32 \text{ m}$$

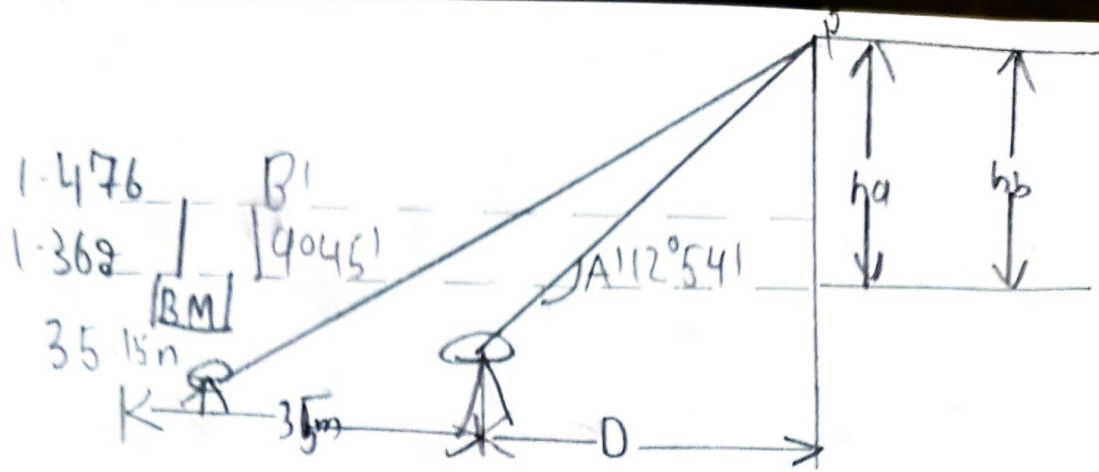
$$O_3 = O_4 = O_8 = \frac{30 \cdot 2}{344} = 2.62 \text{ m}$$

$$O_7 = 0.37 \text{ m}$$

To determine the elevation of top of church tower, the following observations were made. Station A and B and top of church tower are in the same vertical plane.

Instrument Section	Reading on BM	Angle of elevation
Section A	1.476	$9^\circ 54'$
Section B	1.369	$9'' 49'$

Solution:- A.L of Inst-Axis at A' = $35.150 + 1.476 = 36.626$
 A.L of Inst Axis at B' = $35.150 + 1.369 = 36.51$



$$\text{Difference} = hd = 36.686 - 36.519 \Rightarrow hd = 0.114$$

(correction $(b - hd \cot \alpha)$)

$$b - hd \cot \alpha = 35 - 0.114 \cot(90^\circ 45') \Rightarrow 25.41$$

$$h_c = (25.41) \times (\tan \alpha_1 - \tan \alpha_2)$$

$$\tan \alpha_1 - \tan \alpha_2$$

$$h_a = 25.41 \times 0.673 = 17.19 \text{ m}$$

$$\text{A.L of tower} = \text{R.L of A} + h_a$$

$$= 36.686 + 17.19$$

$$= 53.74 \text{ m}$$