2. Indirect method.
   i) Slope area method
   ii) Discharge measuring Structure eg. (Weir, Notch etc)

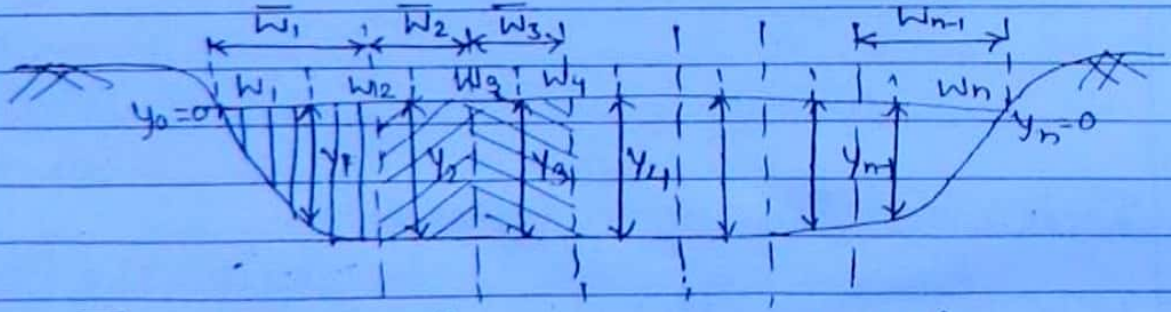
Area Velocity method :-

For calculating discharge the Section of river or stream is divided into number of segment according to the following condition.

1. Discharge in each segment must be less than 10% of the total discharge.
2. Difference in velocities for adjacent Segment s/d not be more than 20%.
3. The Segmental ~~width~~ Width s/d not be more than $\frac{1}{15}^{th}$ to $\frac{1}{20}^{th}$ of the river bed.

Let ΔQ_1, ΔQ_2 ---- be the segmental discharge then total discharge for the stream is given by the summation of $\Delta Q_1, \Delta Q_2$ ----

$$\Sigma (\Delta Q_1 + \Delta Q_2 + \Delta Q_3 ----)$$



$$\bar{W}_1 = \frac{\left(W_1 + \frac{W_2}{2}\right)^2}{2W_1} \; ; \; \bar{W}_2 = \left(\frac{W_2}{2} + \frac{W_3}{2}\right)$$

$$\bar{W}_{n-1} = \frac{\left(W_n + \frac{W_{n-1}}{2}\right)^2}{2W_n}$$

STEP 3 Using this value of discharge find V_1 & V_2

STEP 4 Again Calculate the value of h_f. using the value of V_1 & V_2.

This process is continious until two values of discharge come out to be the same.

for 2 section $K \rightarrow K_1, K_2$

$$K = \sqrt{K_1 K_2}$$

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for 3 section $K \rightarrow K_1, K_2, K_3$

$$K = \sqrt[3]{K_1 K_2 K_3}$$

Q. During the passes of a fluid the following data was Estimated at two Section Seprated by 500 m.

Section	Water Surface Elevation	Area of Flow	R
U/s	85.23 h_1	91.746	2.835
D/s	85.176 h_2	84.354	2.917

The Eddy loss Coefficient for gradual Contration is 0.1 & gradual Expansion is 0.35. Estimate the flood discharge passing through the channel if manning coff. is 0.022.

Sol) $K = \frac{1}{n} A R^{2/3}$

$K_{c/s} = \frac{1}{0.022}(91.746)(2.835)^{2/3}$

$K = 8353.4 \ m^3/s$ (37)

$K_{d/s} = \frac{1}{0.022}(84.354)(2.917)^{2/3}$

$K_{d/s} = 7827.8 \ m^3/s$

$K = \sqrt{K_1 K_2}$

$K = 8086.36$

$Q = K\sqrt{\frac{h_f}{L}} = 8086.36\sqrt{\frac{h_f}{L_0}}$

$h_f = (h_1 - h_2) + (1 - K_e)\left(\frac{V_1^2 - V_2^2}{2g}\right)$

$h_f = 0.054$

$Q = 84.035 \ m^3/sec.$

$V_1 = \frac{Q}{A_1} = .91 \ m/s$

$V_2 = \frac{Q}{A_2} = .99 \ m/s$

$= (85.23 - 85.176) + (1 - 0.1)\left(\frac{V_1^2 - V_2^2}{2g}\right)$

$h_f = 0.04716$

$Q' = 8086.3\sqrt{\frac{61.5}{500}}$

$Q' = 78.53$

$V_1 = \frac{Q'}{A_1} = 0.855$

$V_2 = \frac{Q'}{A} = 0.93$