SNS COLLEGE OF TECHNOLOGY
COIMBATORE - 641 035.
(An Autonomous Institution)

DEPARTMENT OF AGRICULTURAL ENGINEERING

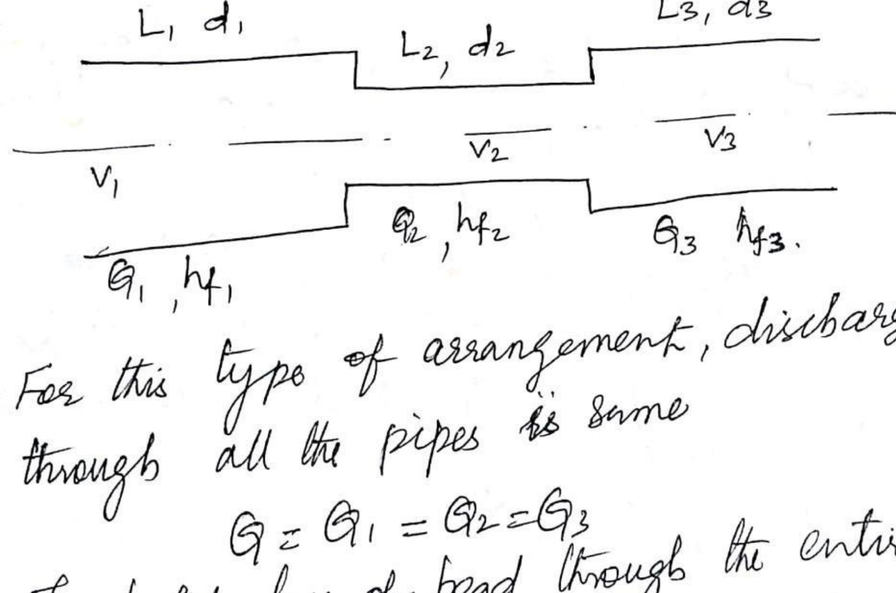
19 MEB 201 - Fluid Mechanics and Machinery

UNIT -2 Flow through pipes in series and in parallel

FLOW THROUGH PIPES IN SERIES AND PARALLEL

Pipes in Series or Compound pipe.

It is defined as the pipes of different diameters and Lengths which are Connected with one another to form a Single pipeline



For this type of arrangement, discharge through all the pipes is same

$$Q = Q_1 = Q_2 = Q_3$$

The total loss of head through the entire System is the Sum of the losses in all individual pipes

$$H = \frac{4f_1 L_1 V_1^2}{2g D_1} + \frac{0.5 V_2^2}{2g} + \frac{4 f_2 L_2 V_2^2}{2g D_2} + \frac{(V_2 - V_3)^2}{2g} + \frac{4 f_3 L_3 V_3^2}{2g D_3}$$

If minor Losses are neglected

$$H = \frac{4f_1 L_1 V_1^2}{2g D_1} + \frac{4 f_2 L_2 V_2^2}{2g D_2} + \frac{4 f_3 L_3 V_3^2}{2g D_3}$$

If coefficient of friction is same for all pipes $f_1 = f_2 = f_3 = f$ then the above equation becomes.

$$H = \frac{4f}{2g}\left[\frac{L_1 V_1^2}{D_1} + \frac{L_2 V_2^2}{D_2} + \frac{L_3 V_3^2}{D_3}\right]$$

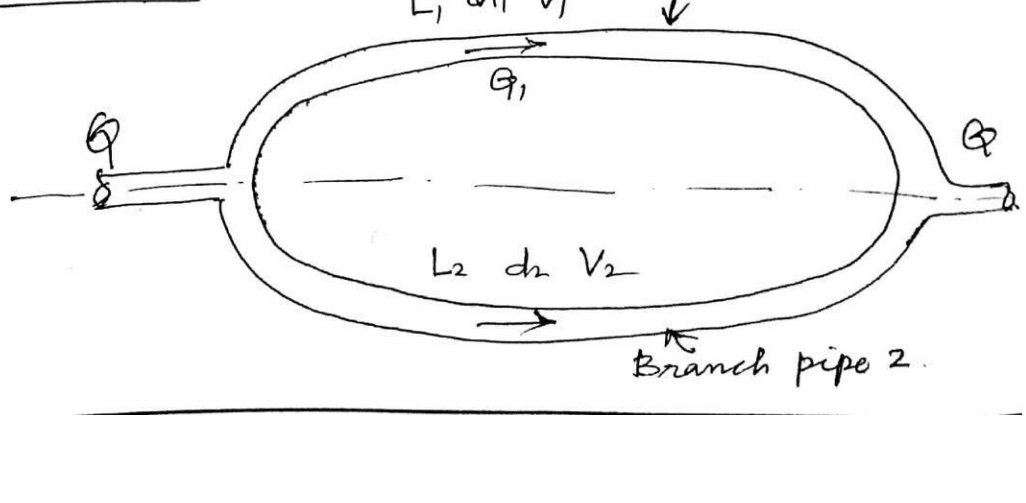
Equivalent pipe:-

$$L = L_1 + L_2 + L_3.$$

$$\frac{L}{D^5} = \left[\frac{L_1}{D_1^5} + \frac{L_2}{D_2^5} + \frac{L_3}{D_3^5}\right]$$

} DUPIT'S EQUATION.

Pipes in parallel:



$Q = Q_1 + Q_2$

$h_f = h_{f_1} = h_{f_2}$

$$h_f = \frac{4 f_1 L_1 V_1^2}{2 g D_1}$$

$$= \frac{4 f_2 L_2 V_2^2}{2 g D_2}$$

If $f_1 = f_2$

Then

$$\frac{L_1 V_1^2}{D_1} = \frac{L_2 V_2^2}{D_2}$$