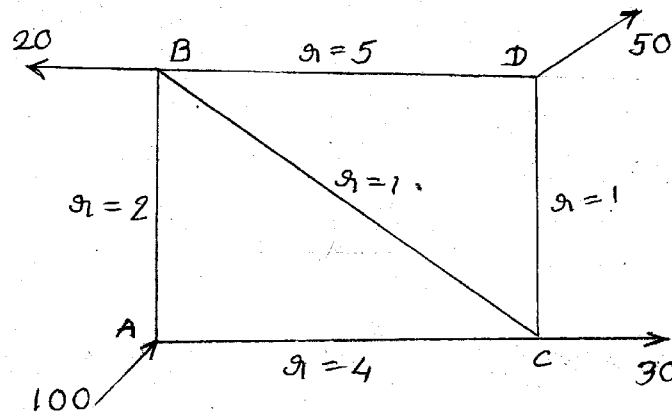




- 3 (a) Explain the use of dimensional analysis and dimensionless numbers in presenting experimental data. 6

OR

- (a) Explain stagnation point and wake formation for various shapes of bodies placed in a flow field. 7
- (b) Draw sketch to show the velocity distribution at a vertical section in pipe for turbulent flow. Write the associated equation. For a turbulent flow in pipe find the value of distance from pipe boundary at which the point velocity is equal to the mean velocity of flow. 7
- (c) Give examples of dimensionally homogeneous and non homogeneous equations. Explain the validity of dimensionally non homogeneous equations. 6
- 4 (a) Derive an expression for the force exerted by jet on a flat plate inclined at an angle of  $\theta$ . 5
- (b) Derive an expression for flow through pipes in series or compound pipe. 5
- (c) Derive the expression for the work done for pelton wheel. 5
- (d) Derive Chezy's equation for head loss due to friction in pipe. 5
- 5 (a) For a pipe network shown in fig. determine the flow in each pipe. The head loss,  $h_L$ , in pipe is given by  $h_L = rQ^2$  and value of 'n' may be assumed as 2.0. 10



- (b) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through a pipe is 300 lit/sec. 4

OR

- 5 (a) An inward flow reaction turbine external and internal diameter as 0.8 m and 0.5 m respectively. The velocity of flow through the runner is constant and is equal to 3.5 m/s. Determine the discharge through the runner and width of the turbine at outlet, if width of the turbine at inlet is 500 mm. 4
- (b) A 200 mm diameter pipe conveying water branches into two pipes of diameter 150 mm and 120 mm respectively. If the average velocity in 200 mm diameter pipe and 150 mm diameter pipe are 5 m/s and 2 m/s respectively. Determine velocity in the 120 mm diameter pipe. 4
- (c) Explain hydraulic gradient line and total energy line with neat sketches. 6
- 6 Write short note on following : (Attempt any four) 16
- (i) Loss of energy due to sudden contraction in pipe.
- (ii) Constant head characteristic curves for Reaction turbine.
- (iii) Jet striking a symmetrical stationary curved vane at the centre. Work done.
- (iv) Energy losses in pipes.
- (v) Power and efficiency of jet striking curved symmetrical blades.
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