

## 3.2 - Bernoulli's Principle

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- (1999) The velocity at a certain point in a flow pipe is  $1.0 \text{ ms}^{-1}$  and the gauge pressure there is  $3 \times 10^5 \text{ N/m}^2$ . The cross-sectional area at a point 10 m above the first is half that at the first point. If the flowing fluid is pure water, calculate the gauge pressure at the second point.
- (2000) Write down the Bernoulli's equations for fluid flow in a pipe and indicate the term which will disappear when the flow of fluid is stopped.
- (2000) Water flows into a tank of large cross-section area at a rate of  $10^{-4} \text{ m}^3/\text{s}$  but flows out from a hole of area  $1 \text{ cm}^2$  which has been punched through the base. How high does the water rise in the tank?
- (2007) Under what conditions is the Bernoulli's equation applicable?
- (2007) Discuss two (2) applications of the Bernoulli's equation.
- (2013) A submarine model is situated in a part of a tube with diameter 5.1 cm where water moves at 2.4 m/s. Determine the:
  - velocity of flow in the water supply pipe of diameter 25.4 cm.
  - pressure difference between the narrow and the wide tube.
- (2015) Write down the Bernoulli's equation for fluid flow in a pipe and indicate the term which will disappear when the fluid is stopped.
- (2015) Basing on the applications of Bernoulli's principle, briefly explain why two ships which are moving parallel and close to each other experience an attractive force.
- (2015) Water is flowing through a horizontal pipe having different cross-sections at two points  $A$  and  $B$ . The diameters of the pipe at  $A$  and  $B$  are 0.6 m and 0.2 m respectively. The pressure difference between points  $A$  and  $B$  is 1 m column of water. Calculate the volume of water flowing per second.
- (2016) Distinguish between static pressure, dynamic pressure and total pressure when applied to streamline or laminar fluid flow and write down expression at a point in the fluid in terms of the fluid velocity  $v$ , the fluid density  $\rho$ , pressure  $P$  and the height  $h$ , of the point with respect to a datum.
- (2016) The static pressure in a horizontal pipeline is  $4.3 \times 10^4 \text{ Pa}$ , the total pressure is  $4.7 \times 10^4 \text{ Pa}$  and the area of cross-section is  $20 \text{ cm}^2$ . The fluid may be considered to be incompressible and non-viscous and has a density of  $1000 \text{ kg/m}^3$ . Calculate the flow velocity and the volume flow rate in the pipeline.

- (2016) Briefly explain the carburetor of a car as applied to Bernoulli's theorem.
- (2016) Three capillaries of the same length but with internal radii  $3R$  ,  $4R$  , and  $5R$  are connected in series and a liquid flows through them under streamline conditions. If the pressure across the third capillary is 8.1 mm of liquid, find the pressure across the first capillary.
- (2017) State Bernoulli's theorem for the horizontal flow.
- (2017) On which principle does the Bernoulli's theorem based.
- (2017) A pipe is running full of water. At a certain point  $A$  , it tapers from 30 cm diameter to 10 cm diameter at  $B$  , the pressure difference between point  $A$  and  $B$  is 100 cm of water column. Find the rate of flow of water through the pipe.
- (2017) Two capillaries of the same length and radii in the ratio of 1:2 are connected in series and the liquid flow through the system under stream line conditions. If the pressure across the two extreme ends of the combination is 1 m of water, what is the pressure difference across the first capillary?
- (2018) Given the Bernoulli's equation:  $p + \rho gh + \rho v^2 = \text{constant}$  where all the symbols carry their usual meaning.
  - What quantity does each expression on the left hand side of the equation represent?
  - Mention any three conditions which make the equation to be valid.
- (2018) Water is supplied to a house at ground level through a pipe of inner diameter 1.5 cm at an absolute pressure of  $6.5 \times 10^5$  Pa and velocity of 5 m/s. The pipe line leading to the second floor bath room 8 m above has an inner diameter of 0.75 cm. Find the flow velocity and pressure at the pipe outlet in the second floor bathroom.
- (2018) A horizontal pipeline increases uniformly from 0.080 m diameter to 0.160 m diameter in the direction of flow of water. When 96 litres of water is flowing per second, a pressure gauge at the 0.080 m diameter section reads  $3.5 \times 10^5$  Pa. What should be the reading of the gauge at the 0.160 m diameter section neglecting any loss?
- (2019) A horizontal pipe of cross - sectional area  $10 \text{ cm}^2$  has one section of cross sectional area  $5 \text{ cm}^2$  . If water flows through the pipe, and the pressure difference between the two sections is 300 Pa, how many cubic meters of water will flow out of the pipe in 1 minute?