

Sample Exam Questions - Module 3

- 1) The chapter containing the first derivation of Bernoulli's equation is called *Hydraulico-Statics*. Why?
- 2) Figure 1 contains the essential elements of Bernoulli's original derivation of his famous equation. a) Explain its meaning and show how Bernoulli gives a qualitative explanation of the relationship between pressure and velocity. b) Reconstruct the main steps that lead to the original derivation. c) Why most of the equations seem dimensionally inconsistent in the original?

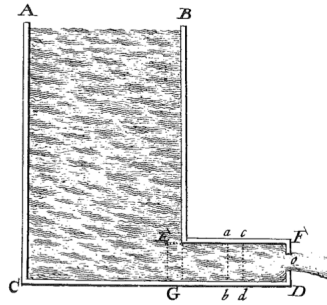


Figure 1: Original derivation of Bernoulli's equation

- 3) What are the main differences between the original derivation and the way we derive Bernoulli's equation today? What was gained and what was lost?
- 4) In the first part of his *Principia motus fluidorum*, Euler obtains a necessary relation between the velocity components of a fluid particle by imposing incompressibility (see Figure 2). Reconstruct the main steps of this derivation for the 2D case with the help of Figure 2.

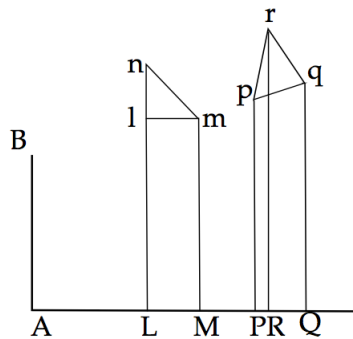


Figure 2: Principia motus fluidorum

5) In Part 2 of the *Principia motus fluidorum* Euler takes a Newtonian approach and describes the forces acting on a fluid particle (see Figure 3). Show how Euler derives his fluid dynamic equations.

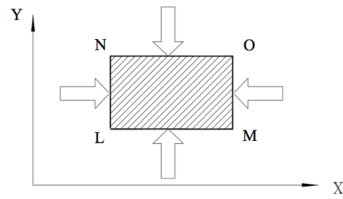


Figure 3: Internal pressures acting on a fluid particle