Fluid Mechanics

2nd Semester 2019/2020

Research Topics:

According the received research template, attempt to write about one topic from the two following topics:

Topic – 01

The complete description of the resultant hydrostatic force acting on both plane and curved surfaces of submerged bodies requires the determination of the magnitude, the direction, and the line of action of the force. Write about different applications that should determine these forces before starting in the design process.

Topic – 02

Many fluid flow devices such as Pelton wheel hydraulic turbine are analyzed by applying the conservation of mass and energy principles, along with the linear momentum equation. Write about different applications that use these principles.

Attempt to answer all questions:

(1) Define the normal force exerted by a fluid per unit area. Also discuss with sketches types of this property. Also show how this property varies with depth in a gravitational field. Mention with sketches at least three measuring devices for this property. Finally discuss with examples, the hydrostatic forces applied on submerged bodies with plane or curved surfaces.

(2) Define the fluid kinematics and introduce several kinematic concepts related to flowing fluids. Also discuss the material derivative then apply it on the acceleration property. Discuss various ways to visualize flow fields. Explain with sketches and appropriate equations, the four fundamental kinematic properties of fluid. In addition to the concepts of vorticity, rotationality, and irrotationality in fluid flows.

(3) Discuss the Reynolds transport theorem (RTT) and it use in fluid mechanics. By two different ways get the conservation of mass relation and discuss various forms of mechanical energy and the efficiency of mechanical work devices such as pumps and turbines.

All The Best

Dr. Abd El-Moneim A. Harb