The following questions are for you to check whether you have understood the contents of the lecture. Please reply to the questions alone (for yourself) and by writing on this sheet of paper. As soon as you and your neighbor are both done, you might want to discuss your answers. Your answers will not be collected or graded. It’s a pure self-test for your convenience. If you are not able to easily answer the questions or if you have doubts regarding the correctness of your replies, please take a few minutes to read in the book or the slides in order to revisit the corresponding points.

1. Give the mathematical definition of vorticity in function of the velocity field of the flow! (K1)

2. What is the extensive property that corresponds to vorticity? What conservation law does it obey? Give the name of the quantity and state in your own words how it evolves in a Lagrangian control volume! (K2)

3. Consider two vortex particles that are a distance \( r \) apart. Particle 1 has a circulation of \( \Gamma_1 \). What is the velocity that is induced by particle 1 on particle 2? Give the formula! (K2)

4. How is an incompressible flow field defined? There are several possible definitions. In the lecture you have learned the simplest one of them. State this definition in a few words! (K1)

Please turn the page…
5. What mathematical property does the velocity field of an incompressible flow fulfill? Give the mathematical expression and explain it in a few words! (K2)

6. Besides hybrid particle-mesh methods, flow can also be simulated with pure particle methods. We will stick to the hybrid formulation. Recall three (3) of the reasons for this choice and state them here in your own words! (K2)

1: 

2: 

3: 

7. Recall two (2) advantages of vortex methods to simulate incompressible flows when compared to classical grid-based methods. State and explain these advantages here in your own words! (K2)

1: 

2: 