Errata – Chapter 1

PROBLEMS*

Introduction, Classification, and System

1–1C Define internal, external, and open-channel flows.

1–2C Define incompressible flow and incompressible fluid. Must the flow of a compressible fluid necessarily be treated as compressible?

1–3C What is the no-slip condition? What causes it?

1–4C What is forced flow? How does it differ from natural flow? Is flow caused by winds forced or natural flow?

1–5C What is a boundary layer? What causes a boundary layer to develop?

1–6C What is the difference between the classical and the statistical approaches?

1–7C What is a steady-flow process?

1–8C Define stress, normal stress, shear stress, and pressure.

1–9C What are system, surroundings, and boundary?

1–10C When is a system a closed system, and when is it a control volume?

Mass, Force, and Units

1–11C What is the difference between pound-mass and pound-force?

1–12C What is the difference between kg-mass and kg-force?

1–13C What is the net force acting on a car cruising at a constant velocity of 70 km/h (*a*) on a level road and (*b*) on an uphill road?

1–14 A 3-kg plastic tank that has a volume of 0.2 m^3 is filled with liquid water. Assuming the density of water is 1000 kg/m^3, determine the weight of the combined system.

1–15 Determine the mass and the weight of the air contained in a room whose dimensions are 6 m × 6 m × 8 m. Assume the density of the air is 1.16 kg/m^3. *Answers:* 334.1 kg, 3277 N

1–16 At 45° latitude, the gravitational acceleration as a function of elevation z above sea level is given by $g = a - bz$, where $a = 9.807$ m/s^2 and $b = 3.32 \times 10^{-6}$ s^{-2}. Determine the height above sea level where the weight of an object will decrease by 1 percent. *Answer:* 29,539 m

1–17E A 150-lbm astronaut took his bathroom scale (a spring scale) and a beam scale (compares masses) to the moon where the local gravity is $g = 5.48$ ft/s^2. Determine how much he will weigh (*a*) on the spring scale and (*b*) on the beam scale. *Answers:* (*a*) 25.5 lbf; (*b*) 150 lbf

1–18 The acceleration of high-speed aircraft is sometimes expressed in *g*'s (in multiples of the standard acceleration of gravity). Determine the net upward force, in N, that a 90-kg man would experience in an aircraft whose acceleration is 6 *g*'s.

1–19 A 5-kg rock is thrown upward with a force of 150 N at a location where the local gravitational acceleration is 9.79 m/s^2. Determine the acceleration of the rock, in m/s^2.

1–20 Solve Prob. 1–19 using EES (or other) software. Print out the entire solution, including the numerical results with proper units.

1–21 The value of the gravitational acceleration g decreases with elevation from 9.807 m/s^2 at sea level to 9.767 m/s^2 at an altitude of 13,000 m, where large passenger planes cruise. Determine the percent reduction in the weight of an airplane cruising at 13,000 m relative to its weight at sea level.

Modeling and Solving Engineering Problems

1–22C What is the difference between precision and accuracy? Can a measurement be very precise but inaccurate? Explain.

1–23C What is the difference between the analytical and experimental approach to engineering problems? Discuss the advantages and disadvantages of each approach.

1–24C What is the importance of modeling in engineering? How are the mathematical models for engineering processes prepared?

1–25C When modeling an engineering process, how is the right choice made between a simple but crude and a complex but accurate model? Is the complex model necessarily a better choice since it is more accurate?

1–26C How do the differential equations in the study of a physical problem arise?

1–27C What is the value of the engineering software packages in (*a*) engineering education and (*b*) engineering practice?

1–28 Determine a positive real root of this equation using EES:

$$2x^3 - 10x^{0.5} - 3x = -3$$

* Problems designated by a "C" are concept questions, and students are encouraged to answer them all. Problems designated by an "E" are in English units, and the SI users can ignore them. Problems with the icon are solved using EES, and complete solutions together with parametric studies are included on the enclosed DVD. Problems with the icon are comprehensive in nature and are intended to be solved with a computer, preferably using the EES software that accompanies this text.

1–17 A 68 kg astronaut took his bathroom scale (a spring scale) and a beam scale (compares masses) to the moon where the local gravity is $g = 1.67$ m/s^2. Determine how much he will weigh (*a*) on the spring scale and (*b*) on the beam scale. *Answers:* (*a*) 11.57kgf; (*b*) 68 kgf

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