

PRACTICE EXAM

Difficulty: MEDIUM

Questions: 15

Thermodynamics & Fluids - MEC511 - Exam 1

Instructions: Answer all questions to the best of your ability. Show your work where applicable.

Section 1: Multiple Choice (40 points total, 10 points each)

Instructions: Choose the best answer for each question.

Question 1: The term 'thermodynamics' originates from which two Greek words?

- A) Atmos (vapor) and kinesis (motion)
- B) Therme (heat) and dynamis (force)
- C) Statikos (equilibrium) and thermos (heat)
- D) Dynamikos (force) and statikos (equilibrium)

Question 2: Which of the following is a characteristic of a closed system?

- A) Mass can cross the system boundary.
- B) Energy cannot cross the system boundary.
- C) The quantity of matter within the system is fixed.
- D) Volume must remain constant.

Question 3: What distinguishes energy transfer by heat from energy transfer by work?

- A) Heat involves mechanical forces, while work involves temperature differences.
- B) Work is always positive, while heat is always negative.
- C) Heat occurs due to a temperature difference, while work does not.
- D) Work can only occur in closed systems, while heat can only occur in open systems.

Question 4: Which statement best describes a system at steady state?

- A) The system's energy is constant.
- B) The system is isolated from its surroundings.
- C) The system undergoes a thermodynamic cycle.
- D) None of the system's properties change with time.

Section 2: Short Answer (30 points total, 10 points each)

Instructions: Answer each question in 2-3 sentences.

Question 5: (10 points) Explain the difference between a macroscopic and a microscopic approach to studying thermodynamics.

Question 6: (10 points) Define what a thermodynamic cycle is and provide an example.

Question 7: (10 points) Explain why work is not considered a property of a system.

Section 3: Problem-Solving (30 points total, 15 points each)

Instructions: Show all your work for full credit.

Question 8: (15 points) A closed system contains a gas. Initially, the gas has an internal energy of 300 kJ. During a process, the system performs 150 kJ of work on its surroundings. At the end of the process, the internal energy of the gas is 200 kJ. Determine the amount of energy transferred as heat, and indicate whether the heat is added to or removed from the system.

Question 9: (15 points) Imagine an object falling under the influence of gravity, with no other forces acting on it. Describe how the object's kinetic energy and potential energy change during the fall, and explain how this demonstrates the conservation of energy.