PRACTICE EXAM

Difficulty: MEDIUM

Questions: 15

MEC511 Thermodynamics & Fluids Exam - Chapter 1

Instructions:

Answer all questions to the best of your ability. Show your work for problem-solving questions to receive full credit.

Section 1: Multiple Choice (4 points each, 40 points total)

Instructions: Choose the best answer for each of the following multiple-choice questions.

Question 1: What Greek words form the basis of the word "Thermodynamics"?
A) Therme and Statics
B) Heat and Motion
C) Therme and Dynamis
D) Energy and Power

Question 2: In thermodynamics, what defines everything external to the system?
A) The boundary
B) The control volume
C) The surroundings
D) The control mass

Question 3: What is a closed system characterized by?
A) Transfer of mass across its boundary
B) Fixed quantity of matter
C) A region of space through which mass may flow
D) Interactions with its surroundings

Question 4: Which of the following best describes the thermodynamic definition of work?
A) Energy transferred due to a temperature difference.
B) Raising a weight as the sole effect external to the system.
C) The energy stored within a system.
D) The change in internal energy of a system.

Question 5: What determines if a quantity is considered a property in thermodynamics?
A) Its dependence on the process path.
B) Its change in value being independent of the process between two states.

C) Its rate of change with respect to time.
D) Its relationship to work and heat transfer.

Question 6: Which statement is true regarding energy transfer by heat?
A) It is induced by work done on the system.
B) It occurs due to a pressure difference.
C) It is induced only by a temperature difference between the system and its surroundings.
D) It always increases the system's internal energy.

Question 7: Which approach characterizes the average behavior of particles within a system?
A) Classical Thermodynamics
B) Macroscopic Approach
C) Statistical Thermodynamics
D) Microscopic Analysis

Question 8: Which of the following is NOT an example of a thermodynamic property?
A) Mass
B) Volume
C) Work
D) Temperature

Question 9: What defines a thermodynamic cycle?
A) A process occurring at a constant temperature.
B) A sequence of processes that begins and ends at the same state.
C) A transformation from one state to another with constant volume.
D) A process with no heat transfer.

Question 10: What happens to the potential energy of an object falling under gravity only?
A) It remains constant.
B) It increases proportionally with time.
C) It decreases as kinetic energy increases.
D) It converts directly to work.

Section 2: Short Answer (6 points each, 30 points total)

Instructions: Answer the following questions in 2-3 sentences.

Question 11: Explain the difference between a closed system and a control volume.

Question 12: Define internal energy and list at least three factors that contribute to it.

Question 13: Explain why work is not a property of a system.

Question 14: Describe the macroscopic approach to studying systems in thermodynamics.

Question 15: What are the two main considerations when selecting a system boundary for thermodynamic analysis?

Section 3: Problem-Solving (10 points each, 30 points total)

Instructions: Show all steps in your calculations to receive full credit.

Question 16: A 2 kg object is initially at rest at a height of 10 meters. It falls under the influence of gravity ($g = 9.81\ m/s^2$). Assuming no air resistance, calculate the kinetic energy of the object just before it hits the ground.

Question 17: A spring initially at its equilibrium length is compressed by an external force. If the work done on the spring is 50 J, how much energy is stored within the spring? Explain.

Question 18: A system undergoes a process where 200 J of work is done *by* the system. If the system is a closed system and its internal energy decreases by 150 J, what is the amount and direction of energy transfer by heat? Justify your answer.