PRACTICE EXAM

Difficulty: MEDIUM

Questions: 10

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# Thermodynamics & Fluids Exam - MEC511

## Instructions

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

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

**Question 1:** For an incompressible substance, which of the following is generally assumed to be constant?
A) Specific internal energy
B) Specific heat
C) Specific volume
D) Enthalpy

**Question 2:** What type of process is defined by the equation pV^n = constant, where n approaches infinity?
A) Isobaric
B) Isothermal
C) Isometric
D) Isentropic

**Question 3:** In a control volume analysis, what does the term "one-dimensional flow" imply about the flowing stream?
A) The fluid velocity changes with time.
B) The fluid properties are uniform across the flow area.
C) The fluid density varies significantly across the flow area.
D) The fluid is incompressible.

**Question 4:** Which of the following devices typically involves a significant pressure drop with little to no change in enthalpy?
A) Turbine
B) Nozzle
C) Throttling device
D) Compressor

**Question 5:** What does 'k' represent in thermodynamics?
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A) Specific volume
B) Specific heat ratio
C) Enthalpy
D) Internal energy

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

Question 6: Explain the difference between specific heat at constant volume (Cv) and specific heat at constant pressure (Cp).

Question 7: Describe two special methods used to evaluate properties of liquids and solids when compressed liquid tables are unavailable.

Question 8: Briefly explain the concept of a polytropic process and provide one real-world example where it might be observed.

Question 9: State the conservation of mass principle for a control volume in simple terms.

Question 10: What is a Nozzle?

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

Question 11: A 2-kg block of aluminum at 100°C is placed in 1 kg of water at 20°C. Assuming the system is isolated and the aluminum and water are incompressible with constant specific heats of 0.9 kJ/kg.K and 4.2 kJ/kg.K, respectively, determine the final equilibrium temperature of the mixture.

Question 12: Oxygen (O2) is heated in a closed, rigid tank from an initial state of 25°C and 100 kPa to a final temperature of 200°C. Assuming ideal gas behavior and a constant specific heat ratio of k = 1.4, determine the final pressure in the tank.

Question 13: Air enters a diffuser at 200 m/s with a temperature of 300 K and exits at a velocity of 50 m/s. Assuming steady-state, steady flow conditions, and negligible heat transfer, determine the exit temperature of the air. (Assume air is an ideal gas with constant specific heat, cp = 1.005 kJ/kg.K).
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