

**NCEES Principles and Practice of Engineering Examination
MECHANICAL—THERMAL AND FLUID SYSTEMS Exam Specifications**

Effective Beginning with the April 2017 Examinations

- The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour morning session, and 40 multiple-choice questions in the 4-hour afternoon session. Examinee works all questions.
- The exam uses both the International System of units (SI) and the U.S. Customary System (USCS).
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

	Approximate Number of Questions
I. Principles	32
A. Basic Engineering Practice	6
1. Engineering terms, symbols, and technical drawings	
2. Economic analysis	
3. Units and conversions	
B. Fluid Mechanics	6
1. Fluid properties (e.g., density, viscosity)	
2. Compressible flow (e.g., Mach number, nozzles, diffusers)	
3. Incompressible flow (e.g., friction factor, Reynolds number, lift, drag)	
C. Heat Transfer Principles (e.g., convection, conduction, radiation)	6
D. Mass Balance Principles (e.g., evaporation, dehumidification, mixing)	4
E. Thermodynamics	6
1. Thermodynamic properties (e.g., enthalpy, entropy)	
2. Thermodynamic cycles (e.g., Combined, Brayton, Rankine)	
3. Energy balances (e.g., 1st and 2nd laws)	
4. Combustion (e.g., stoichiometrics, efficiency)	
F. Supportive Knowledge	4
1. Pipe system analysis (e.g., pipe stress, pipe supports, hoop stress)	
2. Joints (e.g., welded, bolted, threaded)	
3. Psychrometrics (e.g., dew point, relative humidity)	
4. Codes and standards	

II. Hydraulic and Fluid Applications	24
A. Hydraulic and Fluid Equipment	15
1. Pumps and fans (e.g., cavitation, curves, power, series, parallel)	
2. Compressors (e.g., dynamic head, power, efficiency)	
3. Pressure vessels (e.g., design factors, materials, pressure relief)	
4. Control valves (e.g., flow characteristics, sizing)	
5. Actuators (e.g., hydraulic, pneumatic)	
6. Connections (e.g., fittings, tubing)	
B. Distribution Systems (e.g., pipe flow)	9
III. Energy/Power System Applications	24
A. Energy/Power Equipment	8
1. Turbines (e.g., steam, gas)	
2. Boilers and steam generators (e.g., heat rate, efficiency)	
3. Internal combustion engines (e.g., compression ratio, BMEP)	
4. Heat exchangers (e.g., shell and tube, feedwater heaters)	
5. Cooling towers (e.g., approach, drift, blowdown)	
6. Condensers (e.g., surface area, materials)	
B. Cooling/Heating (e.g., capacity, loads, cycles)	6
C. Energy Recovery (e.g., waste heat, storage)	5
D. Combined Cycles (e.g., components, efficiency)	5