

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

Effective Beginning April 2020

- **The exam topics have not changed since April 2017 when they were originally published.**
- The exam is computer-based. It is closed book with an electronic reference.
- Examinees have 9 hours to complete the exam, which contains 80 questions. The 9-hour time includes a tutorial and an optional scheduled break. Examinees work 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 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.

	Number of Questions
I. Principles	28–44
A. Basic Engineering Practice	5–8
1. Engineering terms, symbols, and technical drawings	
2. Economic analysis	
3. Units and conversions	
B. Fluid Mechanics	5–8
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)	5–8
D. Mass Balance Principles (e.g., evaporation, dehumidification, mixing)	4–6
E. Thermodynamics	5–8
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	4–6
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	21–33
A. Hydraulic and Fluid Equipment	13–21
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)	8–12
III. Energy/Power System Applications	21–33
A. Energy/Power Equipment	7–11
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)	5–8
C. Energy Recovery (e.g., waste heat, storage)	5–8
D. Combined Cycles (e.g., components, efficiency)	4–6