THE NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING

Principles and Practice of Engineering Examination
Mechanical Engineering—THERMAL and FLUIDS SYSTEMS Depth Examination

EFFECTIVE October 2008

The mechanical engineering examination is a breadth and depth examination. This means that **all** examinees work the breadth (AM) exam and **one** of the three depth (PM) exams. The three areas covered in the mechanical engineering examination are HVAC and Refrigeration; Mechanical Systems and Materials; and Thermal and Fluids Systems. The breadth exam contains questions from these three areas of mechanical engineering. The depth exams focus more closely on a single area of practice in mechanical engineering.

Thermal and Fluids Systems Depth Module (PM)	**Approximate Percentage of Examination**
I. Principles	**45%**
A. Materials Properties (e.g., density, viscosity)	5%
B. Fluid Mechanics	10%
1. Compressible fluids (e.g., Mach number, nozzles, diffusers)	
2. Incompressible fluids (e.g., friction factor, Reynolds number, lift, drag)	
C. Heat Transfer Principles (e.g., convection, conduction, radiation)	10%
D. Mass Balance Principles (e.g., evaporation, dehumidification, combustion)	7%
E. Thermodynamics	10%
1. Thermodynamic cycles (e.g., combined, Brayton, Rankine)	
2. Thermodynamic properties (e.g., enthalpy, entropy)	
3. Energy balances (e.g., 1st and 2nd Laws)	
4. Combustion (e.g., stoichiometrics)	
F. Related Principles	3%
1. Strength of materials (e.g., stress-strain, yield strength)	
2. Fatigue theory (e.g., Goodman diagram)	
3. Statics and dynamics	
4. Stress analysis (e.g., pipe stress, pipe hangers, hoop stress)	
5. Psychrometrics (e.g., dew point, relative humidity)	
6. Welding (e.g., processes, symbols)	
7. Safety (e.g., OSHA, industrial, ergonomics, sanitation)	
8. Quality control/quality assurance	
II. Applications	**55%**
A. Equipment	18%
1. Pumps	
2. Turbines	
3. Compressors, fans, blowers	
4. Boilers, steam generators	
5. Engines and drive trains	
6. Pressure vessels	
7. Heat exchangers/condensers/feed water heaters	
8. Cooling towers	
9. Control devices (valves, flow measurement)	

B. Systems 32%

1. Power hydraulics
2. Pneumatic
3. Fluid distribution
4. Power conversion
5. Energy recovery
6. Cooling/heating (cycles)
7. Power cycles

C. Codes and Standards 5%

Notes

1. The examination is developed with questions that will require a variety of approaches and methodologies including design, analysis, and application. Some questions may require knowledge of engineering economics.
2. Questions in this module will be in *either* USCS or SI units.
3. The knowledge areas specified under 1, 2, 3, etc., are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.
4. Each depth (PM) exam contains 40 multiple-choice questions. Examinee chooses one depth examination and works all questions in the depth examination chosen.
5. Score results are combined with breadth exam results for final score.