

THE NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING

Principles and Practice of Engineering Examination Mechanical Engineering—HVAC and REFRIGERATION 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.

	Approximate Percentage of Examination
HVAC and Refrigeration Depth Module (PM)	
I. Principles	55%
A. Thermodynamics	7%
1. Cycles	
2. Properties	
3. Compression processes	
B. Psychrometrics	15%
1. Heating/cooling cycles	
2. Humidification/dehumidification	
3. Heating/cooling loads	
C. Heat Transfer	13%
D. Fluid Mechanics	7%
E. Compressible Flow	3%
F. Energy Balances	10%
II. Applications	45%
A. Equipment and Components	20%
1. Cooling towers and fluid coolers (e.g., configurations, conditions, flow rates)	
2. Boilers and furnaces (e.g., configurations, efficiencies, fuel types)	
3. Condensers (e.g., configurations, conditions, flow rates)	
4. Pumps/compressors/fans (e.g., laws, efficiency, selection)	
5. Evaporators chillers (e.g., configurations, conditions, flow rates)	
6. Cooling/heating coils (e.g., configurations, conditions, flow rates)	
7. Control systems components (e.g., valves, dampers)	
8. Refrigerants (e.g., properties, types)	
9. Refrigeration components (e.g., expansion valves, accumulators)	
B. Systems	18%
1. Air distribution (e.g., duct design, system type, terminal devices)	
2. Fluid distribution (e.g., hydronic, oil and/or gas distribution design, system type, steam distribution)	
3. Refrigeration (e.g., food storage, cooling and freezing)	
4. Energy recovery (e.g., enthalpy wheels, heat pipes, run-around systems)	

C. Supportive Knowledges

7%

1. Codes and standards (e.g., ASHRAE, NFPA)
2. Air quality and ventilation (e.g., filtration, dilution)
3. Vibration control (e.g., transmission effect, isolation)
4. Acoustics (e.g., sound control, absorption, attenuators, noise level criteria)
5. Economic analysis
6. Electrical concepts (e.g., power consumption, motor ratings, heat output, amperage)

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 USCS 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.