THE NEW FE EXAM BEGINS JANUARY 2014

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About NCEES

• Develops, administers, and scores examinations used for professional engineering and surveying
• Facilitates professional mobility
• Promotes uniformity for the U.S. licensure processes through member boards and licensees
• 1965–First FE exam is administered.
• 1984–All state licensing boards use FE exam.
• 1996–Afternoon portion of FE is offered in six discipline-specific modules.
  – first step in the licensure process
  – used for outcomes assessment requirement for ABET re-accreditation
The New FE exam

• Computer-based
• Shorter
• Different format
• Different topics covered
Why CBT?

- Candidate convenience
- Quicker score turnaround
- Uniformity in testing conditions
- Enhanced security
- More innovative way to test
Will there be any changes?

• **Length**
  – Appointment time at test center will be 6 hours
    • Tutorial–5 minutes
    • Nondisclosure agreement–5 minutes
    • Exam time–5 hours, 20 minutes with a 25-minute scheduled break after approximately 55 questions
    • Post-exam survey–5 minutes
  – Total of 110 questions
Will there be any changes?

- **Price**
  - TBD in August

- **Registration process**
  - Candidates will be required to pay all exam-related fees directly to NCEES.
  - Online
  - Require payment with MasterCard or Visa
Will there be any changes?

• Testing opportunities
  – Testing windows
    • January–February
    • April–May
    • July–August
    • October–November

• Test center locations
  – Pearson VUE testing centers
Test center locations
Will there be any changes?

- FE Reference Handbook
  - Closed-book exam
  - Electronic
FE exam—supplied reference

A 2^3 experimental design is run using the following levels: For X_1: 10 and 20; for X_2: 5 and 10; and for X_3: 20 and 30. The low level for each factor is represented by 1 and the high level is represented by 2. The table shows the results obtained at random for the eight experimental conditions of the design. Which of the individual choices would be most effective in increasing the value of the response in the region of the experimental conditions given?

<table>
<thead>
<tr>
<th>X_1</th>
<th>X_2</th>
<th>X_3</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>11</td>
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<tr>
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<td>2</td>
<td>1</td>
<td>12</td>
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<td>1</td>
<td>22</td>
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<td>1</td>
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<td>2</td>
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<tr>
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<td>2</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

A. Increase X_1
B. Increase X_2
C. Decrease X_3
D. Decrease X_2

**FIRST LAW OF THERMODYNAMICS**

The First Law of Thermodynamics is a statement of conservation of energy in a thermodynamic system. The net energy crossing the system boundary is equal to the change in energy inside the system.

Heat Q is energy transferred due to temperature difference and is considered positive if it is inward or added to the system. The change in internal energy is given by:

\[ \Delta U = Q - W \]

where:

- \( Q \) = heat transferred
- \( W \) = work done
- \( \Delta U \) = change in internal energy

Energy can cross the boundary only in the form of heat or work. Work can be boundary work, \( W_b \), or other work forms (electrical work, etc.).

First Law (in general) can be considered positive if it is outward or work done by the system. The system boundary is given by \( W = -P\,dV \).

**Special Cases of Closed Systems**

- **Isotropic** (ideal gas):
  \[ W = -P\,dV \]
- **Isobaric**:
  \[ W = -P\,dV \]
- **Isochoric**:
  \[ W = 0 \]

**Special Cases of Open Systems**

- **Constant Volume**:
  \[ W = 0 \]
- **Constant Pressure**:
  \[ W = -P\,dV \]
- **Constant Temperature**:
  \[ W = 0 \]

**Special Cases of Cycles**

- **Charles' Law**:
  \[ W = \frac{-P\,dV}{\gamma - 1} \]
- **Ideal Gas**:
  \[ W = \frac{-P\,dV}{\gamma - 1} \]
- **Polytropic**:
  \[ W = \frac{-P\,dV}{\gamma - 1} \]

**Neatly-Defined Systems**

The system does not change with time. This assumption is valid for steady operation of turbines, pumps, compressors, throttling valves, motors, and heat exchangers, including boilers and condensers.
Will there be any changes?

• Content of the exam
  – 7 free-standing discipline-specific exams
    • Chemical, Civil, Electrical & Computer, Environmental, Industrial, Mechanical, Other Disciplines
  – No separate breadth module
The current FE Elec./Comp. exam

- Mathematics
- Probability and Statistics
- Chemistry
- Computers (merged with Computer Systems)
- Ethics and Business Practices
- Engineering Economics
- Engineering Mechanics (Statics and Dynamics)
- Strength of Materials
- Material Properties (now Properties of Electrical Materials)
- Fluid Mechanics
- Electricity and Magnetism (Engineering Sciences)
- Thermodynamics
- Circuits
- Power
- Electromagnetics
- Control Systems
- Communications
- Signal Processing
- Electronics
- Digital Systems
- Computer Systems
The new FE Elec./Comp. exam

• Mathematics
• Probability and Statistics
• Ethics and Professional Practice
• Engineering Economics
• Properties of Electrical Materials
• Engineering Sciences
• Circuit Analysis (DC and AC Steady State)
• Linear Systems
• Signal Processing
• Electronics
• Power
• Electromagnetics
• Control Systems
• Communications
• Computer Networks
• Digital Systems
• Computer Systems
• Software Development
Other ongoing initiatives

• Opening new test centers
• Development of sample exams
• Institution reports
How can I prepare?

- Review new specifications at ncees.org/CBT
- NCEES sample exams
  - Available online after October 2013 exam administration
Institution reports

- Will be available at least twice per year
- Will change due to the exam methodology
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Questions?