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## AEE Certified Energy Manager (CEM) Sample Questions (Q145-Q150):

### NEW QUESTION # 145

What instrument determines flow rate by measuring pressure differential?

- A. Ultrasonic flow meter
- B. Psychrometer
- C. Infrared camera
- D. Hot-wire anemometer
- E. Pitot tube

**Answer: E**

Explanation:

A Pitot tube measures flow rate by determining the pressure differential in a fluid.

Why is a Pitot Tube the Correct Answer?

- \* It measures dynamic pressure and static pressure in a moving fluid.
- \* Using Bernoulli's equation, it calculates velocity and flow rate.

Analysis of Other Options:

- \* Psychrometer (A): Measures humidity, not flow rate.
- \* Infrared camera (B): Detects temperature differences, not pressure.
- \* Hot-wire anemometer (C): Measures air velocity using heat dissipation, but not pressure differential.
- \* Ultrasonic flow meter (E): Measures flow using sound waves, not pressure.

Thus, the correct answer is D. Pitot tube.

### NEW QUESTION # 146

A facility has the thermal cooling load profile shown in the table below. The utility rate traffic has an no-peak time-of-use period that begins at 10:00 a.m. ends at 7:00 p.m. What chiller capacity (output) is required for a load-leveling operating strategy?

[Question from the previous image, which was about chiller capacity for load leveling, but the table was missing]

- A. 8.0 GJ/h
- B. 5.0 GJ/h
- C. 4.0 GJ/h
- D. 7.0 GJ/h

**Answer: B**

Explanation:

Comprehensive Detailed Step by Step Explanation with all AEE Energy Manager (CEM) References

\* Interpret the load profile (hourly cooling energy): The table gives the facility cooling load in GJ per hour interval (so numerically it's an hourly rate for each hour).

\* Compute the total daily cooling energy (sum of 24 hourly loads):

\* 12:00 a.m.-6:00 a.m.:  $6 \text{ hr} \times 2 = 12 \text{ GJ}$

\* 6:00-7:00 a.m.: 4 # 16 GJ

\* 7:00-8:00 a.m.: 4 # 20 GJ

\* 8:00-9:00 a.m.: 4 # 24 GJ

\* 9:00-10:00 a.m.: 6 # 30 GJ

\* 10:00-11:00 a.m.: 6 # 36 GJ

\* 11:00 a.m.-12:00 p.m.: 8 # 44 GJ

\* 12:00-1:00 p.m.: 8 # 52 GJ

\* 1:00-2:00 p.m.: 9 # 61 GJ

\* 2:00-3:00 p.m.: 9 # 70 GJ

\* 3:00-4:00 p.m.: 9 # 79 GJ

\* 4:00-5:00 p.m.: 9 # 88 GJ

\* 5:00-6:00 p.m.: 8 # 96 GJ

\* 6:00-7:00 p.m.: 6 # 102 GJ

\* 7:00-8:00 p.m.: 6 # 108 GJ

\* 8:00-9:00 p.m.: 4 # 112 GJ

\* 9:00-10:00 p.m.: 4 # 116 GJ

\* 10:00-11:00 p.m.: 2 # 118 GJ

\* 11:00 p.m.-12:00 a.m.: 2 # 120 GJ total per day

So, Total daily cooling energy = 120 GJ.

\* Apply the CEM "load-leveling" operating strategy sizing rule: In the AEE CEM Thermal Storage training material, Load Leveling is described as operating the chiller at a constant (or near constant) load for 24 hours per day, and the "load leveling chiller load calculations" are based on Total energy

/ Hours available to operate chillers-for load leveling, that operating window is 24 hours. portal.

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Therefore:

\* Why the "no-peak 10 a.m.-7 p.m." detail doesn't change the load-leveling answer: That time window is typically used when a strategy restricts chiller operation to certain hours (e.g., full load shifting). But load leveling, per the CEM training description, is the strategy where the chiller runs all day at (near) constant load, using storage to absorb the difference between constant production and variable building load

### NEW QUESTION # 147

Why do electric utility companies transmit power at high voltages?

SELECT THE CORRECT ANSWER

- A. Transmission power losses ( $I^2R$ ) are less
- B. Higher voltages are more stable
- C. Electrical frequency is more stable
- D. Higher voltages are safer

**Answer: A**

Explanation:

Electric utility companies transmit power at high voltages primarily to reduce transmission power losses, which are proportional to the square of the current ( $I^2$ ) multiplied by the resistance ( $R$ ) of the transmission lines. This relationship is expressed by the formula for power loss:  $P_{\text{loss}} = I^2R$ .

Key Points:

\* Power Loss and Current Relationship: Power losses in transmission lines are directly proportional to the square of the current flowing through them. Reducing the current decreases these losses significantly.

\* High Voltage Transmission: By increasing the transmission voltage, the current required to deliver the same amount of power decreases. This is because power ( $P$ ) is the product of voltage ( $V$ ) and current ( $I$ ):  $P = VI$ . For a given power level, increasing voltage allows for a corresponding decrease in current.

\* Reduced  $I^2R$  Losses: Lower current results in reduced  $I^2R$  losses, enhancing the efficiency of power transmission over long distances.

Conclusion:

Transmitting power at high voltages minimizes transmission losses, making it the most efficient method for long-distance electrical power delivery. Therefore, the correct answer is C. Transmission power losses ( $I^2R$ ) are less.

### NEW QUESTION # 148

An energy-saving project costs \$540,000. The project will have maintenance costs of \$25,000 per year. The energy savings from the project are \$160,000 per year. What is the simple payback of the project?

- A. 3.0 years
- B. 5.0 years
- C. 4.0 years
- D. 2.0 years

**Answer: C**

Explanation:

To determine the simple payback period for the energy-saving project, we need to apply the standard formula used in energy management as per the Association of Energy Engineers (AEE) Certified Energy Manager (CEM) guidelines. The simple payback period is a widely used metric in energy efficiency projects to evaluate how long it takes for the initial investment to be recovered through net savings. Let's break this down step-by-step using the provided data and CEM-aligned methodology.

Step 1: Understand the Simple Payback Formula

\* Formula:  $\text{Simple Payback Period (years)} = \frac{\text{Initial Investment Cost}}{\text{Net Annual Savings}}$

\* Definition: The simple payback period represents the time (in years) required for the cumulative savings to equal the initial investment, without considering the time value of money (e.g., discount rates or inflation).

\* CEM Reference: AEE CEM training materials emphasize this formula in the "Energy Economics" section, where simple payback is a fundamental tool for assessing project feasibility.

Step 2: Identify Given Data

\* Initial Investment Cost: \$540,000 (one-time cost of the project).

\* Annual Energy Savings: \$160,000 per year (benefit from the project).

\* Annual Maintenance Costs: \$25,000 per year (additional cost incurred due to the project).

\* Net Annual Savings: This must account for both the savings and the costs incurred annually.

Step 3: Calculate Net Annual Savings

\* Definition: Net annual savings is the difference between the annual energy savings and any additional annual costs (e.g., maintenance).

\* Verification: The problem specifies maintenance costs as an ongoing expense tied to the project, which reduces the effective savings. CEM guidelines require including such costs in payback calculations unless explicitly stated otherwise.

Step 4: Compute the Simple Payback Period

\* Apply the Formula:  $\text{Simple Payback Period} = \frac{\text{Initial Investment Cost}}{\text{Net Annual Savings}}$

$\text{Simple Payback Period} = \frac{540,000}{135,000} = 4.0 \text{ years}$

\* Result: The payback period is exactly 4.0 years, meaning it takes 4 years for the net savings to recover the initial investment.

Step 5: Validate Against Options

\* Options: A. 2.0 years B. 3.0 years C. 4.0 years D. 5.0 years

\* Check:

\* If we ignored maintenance costs (incorrectly),  $\text{payback} = \frac{540,000}{160,000} = 3.375$  years, which rounds to 3.4—not an exact match for any option.

\* With maintenance costs included,  $\text{payback} = \frac{540,000}{135,000} = 4.0$  years, which matches option C precisely.

\* Conclusion: Option C (4.0 years) is correct based on the net savings approach.

#### NEW QUESTION # 149

Exhaust gases from an industrial furnace flow through a heat-recovery steam generator, which generates medium-pressure steam. This steam is used in a steam turbine to generate shaft power driving a fan. Which type of combined heat and power (CHP) cycle does this process describe?

- A. Bottoming cycle
- B. This cycle is not a combined heat and power system
- C. Topping cycle
- D. Combined cycle

**Answer: A**

#### NEW QUESTION # 150

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