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AEE Certified Energy Manager (CEM) Sample Questions (Q10-Q15):

NEW QUESTION # 10

A 50-kW induction motor (1,500 rpm synchronous speed) has a nameplate full-load rotational speed of 1,455 rpm. Field measurements show the actual rotational speed is 1,475 rpm. Using the slip method, calculate the partial load factor of the motor.

- A. 56%
- B. 98%
- C. 101%
- D. 46%
- E. 80%

Answer: E

NEW QUESTION # 11

An outdoor parking area has 25 light poles. Each pole has a 420 Watt (ballast included) high-pressure sodium (HPS) luminaire. The parking area lights are illuminated 4,500 hours per year and the electricity cost is \$0.08 /kWh. What is the annual energy cost reduction if each luminaire is replaced with a 220-Watt (driver included) LED luminaire?

- A. \$1,200/yr
- B. \$2,600/yr
- C. \$1,800/yr
- D. \$2,200/yr
- E. \$1,500/yr

Answer: C

Explanation:

To determine the annual energy cost savings from switching to LED luminaires:
A table with numbers and symbols AI-generated content may be incorrect.

Step 1: Compute Energy Consumption for HPS Lights

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$$\text{Power per pole} = 420 \text{ W} = 0.42 \text{ kW}$$

$$\text{Total Power} = 25 \times 0.42 = 10.5 \text{ kW}$$

$$\text{Annual Energy Use} = 10.5 \times 4,500 = 47,250 \text{ kWh}$$

$$\text{Annual Cost} = 47,250 \times 0.08 = 3,780 \text{ USD}$$

Step 2: Compute Energy Consumption for LED Lights

$$\text{Power per pole} = 220 \text{ W} = 0.22 \text{ kW}$$

$$\text{Total Power} = 25 \times 0.22 = 5.5 \text{ kW}$$

$$\text{Annual Energy Use} = 5.5 \times 4,500 = 24,750 \text{ kWh}$$

$$\text{Annual Cost} = 24,750 \times 0.08 = 1,980 \text{ USD}$$

Step 3: Compute Cost Savings

$$\text{Savings} = 3,780 - 1,980 = 1,800 \text{ USD/year}$$

Thus, the correct answer is **C. \$1,800/yr.**

NEW QUESTION # 12

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

Answer: D

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

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

* 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, $\frac{540,000}{135,000} = 4.0$ years, which matches option C precisely.

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

NEW QUESTION # 13

You can buy air compressor A for \$15,000 or air compressor B for \$6,000. Compressor A will cost \$10,000 per year to operate. Compressor B will cost \$11,500 per year to operate. If both air compressors have a 10-year life and your required return on investment is 12%, which air compressor has the lowest total life-cycle cost?

- A. Compressor B
- B. Both air compressors have the same life-cycle cost
- C. Compressor A

Answer: A

NEW QUESTION # 14

A cooling tower is delivering water to a chilled-water plant. The cooling tower outlet temperature has a 6°C approach temperature to the ambient air, wet-bulb temperature. The outside air conditions are 20°C dry bulb, 60% relative humidity. Using the psychrometric chart, at what temperature can the cooling tower deliver water to the chilled-water plant?

- A. 17°C
- B. 25°C
- C. 13°C
- D. 21°C

Answer: A

NEW QUESTION # 15

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