

Roll No



**PRESIDENCY UNIVERSITY  
BENGALURU**

**SET B**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JAN 2024**

**Semester :** Semester V - 2021

**Course Code :** EEE3026

**Course Name :** Energy Auditing and Demand Side Management

**Program :** B.Tech.

**Date :** 0J-JAN-2024

**Time :** 9:30AM - 12:30 PM

**Max Marks :** 100

**Weightage :** 50%

**Instructions:**

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

**PART A**

**ANSWER ALL THE QUESTIONS**

**5 X 2M = 10M**

1. List the primary objectives of energy conservation, and how can individuals contribute to it in their daily lives?  
(CO1) [Knowledge]
2. What are some effective energy-saving methods applicable to boilers, and how do they contribute to reduced energy consumption?  
(CO2) [Knowledge]
3. List the main components involved in split Air conditioning systems and highlight its typical applications.  
(CO3) [Knowledge]
4. Define the term "Variable-Frequency Drives (VFDs)" in the context of electrical load management. How do VFDs contribute to energy savings?  
(CO4) [Knowledge]
5. How does regular preventive maintenance contribute to prolonged motor efficiency?  
(CO5) [Knowledge]

**PART B**

**ANSWER ALL THE QUESTIONS**

**5 X 10M = 50M**

6. How can sensitivity analysis enhance the decision-making process in energy audits and contribute to better energy management? Present a case study highlighting the application of sensitivity analysis in identifying key variables and offering actionable solutions to mitigate risks and optimize energy efficiency.  
(CO1) [Comprehension]

7. Discuss a comprehensive energy audit plan for a newly constructed commercial building by outlining the specific steps involved in conducting an energy audit, including a detailed water audit. Propose energy-saving measures tailored to the characteristics of new buildings, considering architectural design, insulation, lighting systems, and HVAC efficiency while discussing the importance of continuous monitoring and feedback in sustaining energy efficiency.

(CO2) [Comprehension]

8. How can a comprehensive energy audit define the roadmap for effective energy conservation strategies in a world striving for sustainability? Summarize a detailed overview of the energy audit process, its primary objectives, and the role it plays in shaping energy scenarios. Offer solutions on how governments and businesses can collaborate to implement impactful energy conservation measures based on audit findings.

(CO1) [Comprehension]

9. Outline the fundamental electrical basics, emphasizing the relationship between voltage, current, and power by proposing strategies for effective load management, incorporating variable-frequency drives and addressing the impact of harmonics on the electrical system. Develop a plan for optimizing electricity usage based on electricity tariffs and power factor considerations.

(CO4) [Comprehension]

10. Explain the key parameters assessed during an energy audit for motors. Elaborate on how motor size, load factor, and operating conditions impact energy efficiency. Provide examples of energy-saving measures for motors, and discuss the rationale behind each recommendation.

(CO5) [Comprehension]

### PART C

**ANSWER ALL THE QUESTIONS**

**2 X 20M = 40M**

**11. Current Chiller:**

**Type:** Centrifugal Chiller

**Capacity:** 1,200 tons

**Efficiency:** 0.8 kW/ton

**Operating Hours:** 4,000 hours per year

**Electricity Cost:** \$0.12 per kWh

**Maintenance Cost:** \$20,000 per year

**Expected Remaining Lifespan:** 8 years

**Proposed New Chiller:**

**Type:** High-Efficiency Centrifugal Chiller

**Capacity:** 1,200 tons

**Efficiency:** 0.5 kW/ton (substantial improvement)

**Operating Hours:** 4,000 hours per year

**Electricity Cost:** \$0.12 per kWh

**Maintenance Cost:** Estimated to be \$10,000 per year due to advanced technology

**Initial Investment:** \$500,000

**Expected Lifespan:** 20 years

Based on the data given in the question

i) Identify the unknown parameters that could be computed from the given data

ii) Compute the unknown parameters

(CO4) [Application]

12. A 20 hp motor driving a pump is operating on 440 volts and has a loaded line amperage of 16.5. When disconnected from the motor, the load amperage is 9.3, nameplate amperage for 440 volts is 24 A. The synchronous speed of the induction motor is 1500 rpm. and the motor is running at 1480 rpm. The nameplate rating is 1475 rpm. If it draws 18 kW of electrical power

i) Identify the unknown parameters that could be computed from the given data

ii) Compute the unknown parameters

(CO5) [Application]