

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK



VI - SEMESTER

PME303 - ENERGY CONSERVATION IN INDUSTRIES

Regulation–2023

Academic Year 2025–26 (Even Semester)

Prepared by

Dr.S.Sivasankar,

Assistant Professor/Mech

UNIT - I INTRODUCTION

Energy scenario of World, India and TN - Environmental aspects of Energy Generation – Material and Energy balancing - Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Basic instruments for Energy Auditing

PART - A (2 Marks)

Q.No	Questions	BTL Level	BTL Expansion
1	Define energy scenario.	BTL 1	Remembering
2	List the major primary energy sources used worldwide.	BTL 1	Remembering
3	State the present trend in global energy consumption.	BTL 1	Remembering
4	Identify any two challenges faced by the Indian energy sector.	BTL 1	Remembering
5	Mention the role of coal in India's energy mix.	BTL 1	Remembering
6	List the major energy resources of Tamil Nadu.	BTL 1	Remembering
7	Compare conventional and non-conventional energy sources.	BTL 2	Understanding
8	Define environmental impact related to energy generation.	BTL 1	Remembering
9	List any two environmental issues caused by thermal power plants.	BTL 1	Remembering
10	Interpret the term greenhouse gas emissions in power generation.	BTL 2	Understanding
11	State the importance of renewable energy in environmental protection.	BTL 2	Understanding
12	Define material balance.	BTL 1	Remembering
13	Define energy balance.	BTL 1	Remembering
14	Distinguish between material balance and energy balance.	BTL 2	Understanding
15	State the objective of energy balancing in industries.	BTL 2	Understanding
16	Define energy auditing.	BTL 1	Remembering

17	State the necessity of energy auditing in industries.	BTL 2	Understanding
18	List the types of energy audit.	BTL 1	Remembering
19	Outline any two steps in energy audit methodology.	BTL 2	Understanding
20	Identify any two barriers to energy auditing.	BTL 1	Remembering
21	Categorize organizational and technical barriers in energy auditing.	BTL 2	Understanding
22	State the responsibilities of an energy manager.	BTL 1	Remembering
23	List the functions of an energy manager in an industry.	BTL 1	Remembering
24	Name any two basic instruments used for energy auditing.	BTL 1	Remembering
25	State the purpose of using instruments in energy auditing.	BTL 2	Understanding

PART - B (16 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Compare the world and Indian energy scenarios with respect to demand and supply.	BTL 4	Analyzing
2	Examine the present energy consumption pattern in India and suggest measures for improvement.	BTL 4	Analyzing
3	Assess the energy scenario of Tamil Nadu and recommend suitable enhancement strategies.	BTL 4	Analyzing
4	Analyze the environmental impacts associated with fossil fuel-based power generation.	BTL 4	Analyzing
5	Illustrate the role of renewable energy sources in minimizing environmental damage.	BTL 3	Applying
6	Evaluate the benefits of clean energy technologies in environmental sustainability.	BTL 4	Analyzing

7	Demonstrate material balance for an industrial process using a suitable flow diagram.	BTL 3	Applying
8	Examine how energy balance helps in identifying losses in an industrial system.	BTL 4	Analyzing
9	Determine energy efficiency improvements based on energy balancing techniques.	BTL 3	Applying
10	Justify the need for conducting energy audits in industrial plants.	BTL 3	Applying
11	Differentiate various types of energy audits with relevant industrial examples.	BTL 4	Analyzing
12	Illustrate the methodology of performing an energy audit in a manufacturing industry.	BTL 3	Applying
13	Examine the major barriers to energy auditing in industries.	BTL 4	Analyzing
14	Propose suitable solutions to overcome barriers in energy auditing.	BTL 3	Applying
15	Analyze the role and responsibilities of an energy manager in energy conservation.	BTL 4	Analyzing
16	Demonstrate how an energy manager contributes to improving plant energy performance.	BTL 3	Applying
17	Examine the operating principle and use of basic energy auditing instruments.	BTL 4	Analyzing
18	Select appropriate energy auditing instruments for monitoring industrial energy consumption.	BTL 3	Applying

UNIT – II ELECTRICAL SUPPLY SYSTEMS

Electricity Tariff structures – Typical Billing - Demand Side Management - HT and LT supply - Power Factor – Energy conservation in Transformers – Harmonics.

PART - A (2 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Define electricity tariff.	BTL 1	Remembering
2	List the objectives of electricity tariff structures.	BTL 1	Remembering

3	State the components of an electricity tariff.	BTL 1	Remembering
4	Identify different types of electricity tariff structures.	BTL 1	Remembering
5	Distinguish between flat rate tariff and block rate tariff.	BTL 2	Understanding
6	Define typical electricity billing.	BTL 1	Remembering
7	List the information available in an electricity bill.	BTL 1	Remembering
8	State the significance of maximum demand in billing.	BTL 2	Understanding
9	Identify the role of energy charges in electricity billing.	BTL 2	Understanding
10	Define demand side management.	BTL 1	Remembering
11	List the objectives of demand side management.	BTL 1	Remembering
12	State any two demand side management techniques.	BTL 1	Remembering
13	Interpret the benefits of demand side management to utilities.	BTL 2	Understanding
14	Define HT supply.	BTL 1	Remembering
15	Define LT supply.	BTL 1	Remembering
16	Compare HT and LT supply systems.	BTL 2	Understanding
17	Define power factor.	BTL 1	Remembering
18	State the importance of maintaining high power factor.	BTL 2	Understanding
19	Identify causes of low power factor in industries.	BTL 1	Remembering
20	Define energy conservation in transformers.	BTL 1	Remembering
21	List losses occurring in transformers.	BTL 1	Remembering
22	State methods to reduce transformer losses.	BTL 2	Understanding

23	Define harmonics in electrical systems.	BTL 1	Remembering
24	Identify sources of harmonics in power systems.	BTL 1	Remembering
25	State the impact of harmonics on electrical equipment.	BTL 2	Understanding

PART - B (16 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Analyze various electricity tariff structures used for industrial consumers.	BTL 4	Analyzing
2	Compare different tariff systems and assess their suitability for industries.	BTL 4	Analyzing
3	Illustrate a typical industrial electricity bill and interpret its major components.	BTL 3	Applying
4	Examine the effect of maximum demand charges on industrial electricity billing.	BTL 4	Analyzing
5	Apply demand side management techniques for reducing peak electrical demand.	BTL 3	Applying
6	Analyze the role of demand side management in energy conservation programs.	BTL 4	Analyzing
7	Differentiate HT and LT supply systems with respect to energy efficiency and cost.	BTL 4	Analyzing
8	Evaluate the advantages of HT supply for large industrial consumers.	BTL 4	Analyzing
9	Determine suitable power factor improvement methods for an industrial plant.	BTL 3	Applying
10	Analyze the effects of poor power factor on electrical systems and tariff.	BTL 4	Analyzing
11	Illustrate power factor correction techniques using industrial examples.	BTL 3	Applying
12	Examine transformer losses and their influence on energy efficiency.	BTL 4	Analyzing
13	Apply energy conservation techniques to improve transformer performance.	BTL 3	Applying
14	Assess the benefits of energy-efficient transformer operation in industries.	BTL 4	Analyzing

15	Analyze the causes and effects of harmonics in power systems.	BTL 4	Analyzing
16	Illustrate harmonic distortion using nonlinear load examples.	BTL 3	Applying
17	Evaluate harmonic mitigation techniques for industrial electrical systems.	BTL 4	Analyzing
18	Select appropriate harmonic filters for reducing power quality issues.	BTL 3	Applying

UNIT - III ENERGY CONSERVATION IN MAJOR THERMAL UTILITIES

Stoichiometry - Combustion principles. Energy conservation in: Boilers - Steam Distribution Systems - Furnaces - Thermic Fluid Heaters – Cooling Towers – D.G. sets. Insulation and Refractories - Waste Heat Recovery Devices.

PART - A (2 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Define stoichiometry.	BTL 1	Remembering
2	State the importance of stoichiometric air in combustion.	BTL 2	Understanding
3	Define excess air in combustion processes.	BTL 1	Remembering
4	Identify the products of complete combustion.	BTL 1	Remembering
5	State the significance of combustion efficiency.	BTL 2	Understanding
6	Define boiler efficiency.	BTL 1	Remembering
7	List the major energy losses occurring in boilers.	BTL 1	Remembering
8	State any two methods to improve boiler efficiency.	BTL 2	Understanding
9	Define steam distribution system.	BTL 1	Remembering
10	Identify causes of steam leakage in distribution networks.	BTL 1	Remembering
11	State the importance of steam traps in distribution systems.	BTL 2	Understanding

12	Define industrial furnace.	BTL 1	Remembering
13	List types of industrial furnaces.	BTL 1	Remembering
14	State the role of excess air control in furnaces.	BTL 2	Understanding
15	Define thermic fluid heater.	BTL 1	Remembering
16	State an advantage of thermic fluid heating over steam heating.	BTL 2	Understanding
17	Define cooling tower.	BTL 1	Remembering
18	Identify factors affecting cooling tower efficiency.	BTL 1	Remembering
19	State the importance of cooling water management.	BTL 2	Understanding
20	Define diesel generator set.	BTL 1	Remembering
21	Identify losses occurring in D.G. sets.	BTL 1	Remembering
22	State methods to improve fuel efficiency of D.G. sets.	BTL 2	Understanding
23	Define insulation and refractories.	BTL 1	Remembering
24	State the function of refractory materials in thermal systems.	BTL 2	Understanding
25	Define waste heat recovery.	BTL 1	Remembering

PART - B (16 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Apply stoichiometric calculations to determine air requirement for fuel combustion.	BTL 3	Applying
2	Analyze the effect of excess air on combustion efficiency and heat losses.	BTL 4	Analyzing
3	Illustrate combustion principles using temperature–air–fuel relationships.	BTL 3	Applying

4	Analyze boiler energy losses and their impact on overall boiler efficiency.	BTL 4	Analyzing
5	Apply suitable energy conservation measures for improving boiler performance.	BTL 3	Applying
6	Examine steam distribution losses and their causes in industrial plants.	BTL 4	Analyzing
7	Apply energy-saving practices in steam distribution systems.	BTL 3	Applying
8	Analyze energy efficiency improvement methods in industrial furnaces.	BTL 4	Analyzing
9	Illustrate furnace performance optimization through combustion control.	BTL 3	Applying
10	Assess energy conservation opportunities in thermic fluid heating systems.	BTL 4	Analyzing
11	Apply operational measures to reduce heat losses in thermic fluid heaters.	BTL 3	Applying
12	Examine cooling tower performance parameters and energy conservation methods.	BTL 4	Analyzing
13	Determine suitable methods for improving cooling tower efficiency.	BTL 3	Applying
14	Analyze fuel consumption patterns and losses in D.G. sets.	BTL 4	Analyzing
15	Apply energy efficiency measures to enhance D.G. set performance.	BTL 3	Applying
16	Examine the role of insulation and refractories in reducing thermal losses.	BTL 4	Analyzing
17	Analyze different waste heat recovery devices used in industries.	BTL 4	Analyzing
18	Select appropriate waste heat recovery systems for industrial applications.	BTL 3	Applying

UNIT – IV ENERGY CONSERVATION IN MAJOR ELECTRICAL UTILITIES

Energy conservation in: Motors - Pumps – Fans – Blowers - Compressed Air Systems
- Refrigeration and Air Conditioning Systems - Illumination systems.

PART - A (2 Marks)

Q.No	Question	BTL Level	BTL Expansion
-------------	-----------------	------------------	----------------------

1	Define energy conservation in electric motors.	BTL 1	Remembering
2	List losses occurring in electric motors.	BTL 1	Remembering
3	State the role of motor efficiency in energy conservation.	BTL 2	Understanding
4	Identify factors affecting motor performance.	BTL 1	Remembering
5	Define pump efficiency.	BTL 1	Remembering
6	List types of pumps commonly used in industries.	BTL 1	Remembering
7	State the importance of correct pump selection.	BTL 2	Understanding
8	Define industrial fan.	BTL 1	Remembering
9	Identify applications of fans in industries.	BTL 1	Remembering
10	State the significance of fan system optimization.	BTL 2	Understanding
11	Define blower.	BTL 1	Remembering
12	Distinguish between fans and blowers.	BTL 2	Understanding
13	Define compressed air system.	BTL 1	Remembering
14	Identify major energy losses in compressed air systems.	BTL 1	Remembering
15	State the importance of leak detection in compressed air systems.	BTL 2	Understanding
16	Define refrigeration system.	BTL 1	Remembering
17	State the principle of vapour compression refrigeration.	BTL 1	Remembering
18	Identify factors affecting refrigeration system efficiency.	BTL 1	Remembering
19	State the importance of energy conservation in refrigeration systems.	BTL 2	Understanding
20	Define air conditioning system.	BTL 1	Remembering

21	List components of an air conditioning system.	BTL 1	Remembering
22	State the role of proper maintenance in air conditioning efficiency.	BTL 2	Understanding
23	Define illumination system.	BTL 1	Remembering
24	Identify types of lamps used for industrial lighting.	BTL 1	Remembering
25	State the importance of energy-efficient illumination systems.	BTL 2	Understanding

PART - B (16 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Analyze energy conservation opportunities in industrial motor systems.	BTL 4	Analyzing
2	Apply suitable motor selection and maintenance practices to improve energy efficiency.	BTL 3	Applying
3	Examine pump system losses and their effect on overall system efficiency.	BTL 4	Analyzing
4	Determine appropriate energy-saving measures for industrial pumping systems.	BTL 3	Applying
5	Analyze performance characteristics of fans used in industrial applications.	BTL 4	Analyzing
6	Illustrate energy-efficient fan system design and operation.	BTL 3	Applying
7	Compare blower system efficiency under varied operating conditions.	BTL 4	Analyzing
8	Apply operational improvements to reduce energy consumption in blower systems.	BTL 3	Applying
9	Analyze energy wastage in compressed air systems and its causes.	BTL 4	Analyzing
10	Apply conservation techniques for improving compressed air system efficiency.	BTL 3	Applying
11	Examine the performance of refrigeration systems with respect to energy consumption.	BTL 4	Analyzing
12	Illustrate energy-saving measures in industrial refrigeration systems.	BTL 3	Applying

13	Analyze factors influencing energy consumption in air conditioning systems.	BTL 4	Analyzing
14	Apply suitable control strategies to improve air conditioning system efficiency.	BTL 3	Applying
15	Analyze illumination levels and energy use in industrial lighting systems.	BTL 4	Analyzing
16	Determine appropriate lighting system designs for energy conservation.	BTL 3	Applying
17	Evaluate the impact of efficient lighting technologies on industrial energy consumption.	BTL 4	Analyzing
18	Select suitable illumination systems to achieve optimal energy efficiency.	BTL 3	Applying

UNIT – V ENERGY MONITORING, TARGETING, LABELLING AND ECONOMICS

Elements of Monitoring & Targeting System – CUSUM - Energy / Cost index diagram
 – Energy Labelling - Energy Economics – Cost of production and Life Cycle Costing -
 Economic evaluation techniques – Discounting and Non-Discounting - ESCO concept
 – PAT scheme

PART - A (2 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Define energy monitoring.	BTL 1	Remembering
2	State the objectives of energy targeting.	BTL 1	Remembering
3	Identify elements of a monitoring and targeting system.	BTL 1	Remembering
4	State the role of energy performance indicators in monitoring systems.	BTL 2	Understanding
5	Define CUSUM.	BTL 1	Remembering
6	Identify the purpose of CUSUM in energy management.	BTL 2	Understanding
7	Define energy index.	BTL 1	Remembering
8	Define cost index.	BTL 1	Remembering
9	State the significance of energy and cost index diagrams.	BTL 2	Understanding

10	Define energy labeling.	BTL 1	Remembering
11	Identify objectives of energy labeling programs.	BTL 1	Remembering
12	State the benefits of energy labeling to consumers.	BTL 2	Understanding
13	Define energy economics.	BTL 1	Remembering
14	State factors influencing energy cost in industries.	BTL 1	Remembering
15	Identify components of cost of production.	BTL 1	Remembering
16	State the importance of energy cost in production economics.	BTL 2	Understanding
17	Define life cycle costing.	BTL 1	Remembering
18	State the importance of life cycle costing in energy projects.	BTL 2	Understanding
19	Identify non-discounting economic evaluation techniques.	BTL 1	Remembering
20	Identify discounting economic evaluation techniques.	BTL 1	Remembering
21	State the significance of discounting in energy economics.	BTL 2	Understanding
22	Define ESCO.	BTL 1	Remembering
23	State the role of ESCO in energy efficiency projects.	BTL 2	Understanding
24	Define PAT scheme.	BTL 1	Remembering
25	State the objective of the PAT scheme in India.	BTL 2	Understanding

PART - B (16 Marks)

Q.No	Question	BTL Level	BTL Expansion
1	Illustrate the elements of an energy monitoring and targeting system for an industrial plant.	BTL 3	Applying

2	Analyze the effectiveness of monitoring and targeting systems in improving energy performance.	BTL 4	Analyzing
3	Demonstrate the construction and interpretation of a CUSUM chart using industrial data.	BTL 3	Applying
4	Examine the role of CUSUM analysis in detecting energy deviations.	BTL 4	Analyzing
5	Illustrate energy and cost index diagrams and interpret their significance in energy management.	BTL 3	Applying
6	Analyze energy index trends and their impact on industrial operating costs.	BTL 4	Analyzing
7	Assess the effectiveness of energy labeling programs in promoting energy-efficient products.	BTL 4	Analyzing
8	Apply energy labeling concepts to evaluate the efficiency of household or industrial equipment.	BTL 3	Applying
9	Analyze the role of energy economics in industrial decision-making.	BTL 4	Analyzing
10	Determine the cost of production for an industrial product considering energy expenses.	BTL 3	Applying
11	Apply life cycle costing technique for evaluating an energy conservation project.	BTL 3	Applying
12	Compare life cycle cost with initial cost in selecting energy-efficient equipment.	BTL 4	Analyzing
13	Apply non-discounting economic evaluation techniques for energy investment analysis.	BTL 3	Applying
14	Analyze discounting techniques and their influence on energy project selection.	BTL 4	Analyzing
15	Examine the ESCO business model and its applicability in industrial energy efficiency projects.	BTL 4	Analyzing
16	Apply the ESCO concept to implement an energy conservation measure in an industry.	BTL 3	Applying
17	Analyze the objectives and implementation challenges of the PAT scheme.	BTL 4	Analyzing
18	Assess the impact of the PAT scheme on national industrial energy efficiency.	BTL 4	Analyzing