GUJARAT TECHNOLOGICAL UNIVERSITY

BE 6 SEMESTER – OLD PAPER – SUMMER 2022 TO SUMMER 2026 – QUESTION BANK

Subject Name & Code: Energy Conservation - 3160916

Chapter 1: Energy Audit Methodology and recent trends

Repeated Questions:

1. Energy Audit – Basics, Instruments and Reporting:

- **Q.** What is Energy Audit? Why it is important? **(SUMMER 2022, 3 Marks; WINTER 2022, 3 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks)**
- **Q.** Classify energy audit & explain the three phases of detailed energy audit. **(WINTER 2023, 4 Marks; WINTER 2025, 7 Marks)**
- **Q.** Write down guidelines for writing energy audit report. **(SUMMER 2022, 7 Marks; WINTER 2022, 4 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks OR; SUMMER 2025, 7 Marks; WINTER 2025, 3 Marks)**
- **Q.** Explain various instruments used for performing energy audit. / List out Instruments for Audit and Monitoring Energy and Energy Savings. **(SUMMER 2022; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; WINTER 2024; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**

2. Energy Management:

- **Q.** Explain objective and general principles of Energy management. / Define energy management. Write down its objective. / Explain general principle of energy management. / Short note on general principles of Energy Management. / Explain general principles of energy management & skills required for energy management. **(WINTER 2022, 4 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks)**
- **Q.** What do you mean by Energy Management Skills? / Explain skills required for Energy Manager. **(SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; WINTER 2024, 7 Marks)**
- **Q.** Explain energy management strategy. / Explain energy management strategies. **(WINTER 2022, 7 Marks; SUMMER 2026, 4 Marks)**

3. Economics of Energy Optimization Projects:

- **Q.** Discuss Economics of implementation of energy optimization projects, its constraints, barriers and limitations. / Explain limitations of energy optimization projects. **(SUMMER 2022, 7 Marks; SUMMER 2023, 3 Marks)**

Other Important Questions:

1. Energy Audit – Basics:

- **Q.** Explain requirements of energy audit in different sectors. **(SUMMER 2026, 3 Marks)**
- **Q.** What is energy audit? Explain elements of energy audit. **(SUMMER 2024, 3 Marks)**
- **Q.** Compare preliminary audit and detailed audit. **(SUMMER 2023, 4 Marks)**

2. Financial Appraisal:

- **Q.** Define the following: i) Payback period ii) ROI iii) NPV iv) IRR **(SUMMER 2024, 4 Marks)**
- **Q.** State advantages and limitations of NPV and Payback period. **(WINTER 2023, 3 Marks)**

3. Energy Management, Conservation Act and BEE:

- **Q.** Explain the general principle of energy management and skill required for energy management. **(SUMMER 2025 (OR))**

- **Q.** Explain role of Bureau of Energy Efficiency (BEE). **(SUMMER 2024, 3 Marks)**
- **Q.** Why was energy conservation act framed? Explain the term "designated consumers" and "BEE" with respect to it. **(SUMMER 2026)**
- **Q.** Explain importance of energy conservation and role of standards and labelling in it. **(SUMMER 2023)**

4. Renewable Energy and Case Studies:

- **Q.** Explain impact of renewable energy on energy audit recommendations. **(SUMMER 2026, 4 Marks)**
- **Q.** Discuss Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities. **(SUMMER 2022, 7 Marks OR)**

Chapter 2: Electrical Distribution and Utilization

Repeated Questions:

1. Transformers:

- **Q.** How losses are reduced in Transformer? / Explain methods to reduce eddy current losses and copper losses in transformer. **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 3 Marks; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**
- **Q.** State advantages of parallel operation of transformer. / Write Importance of parallel operations in power system. / Write importance of parallel operation of transformers. **(SUMMER 2022, 3 Marks; SUMMER 2024, 7 Marks; WINTER 2024, 3 Marks)**

2. Losses and Power Factor:

- **Q.** Explain causes of high transmission and distribution losses. / Explain methods to reduce T&D losses. / Define T & D losses. / Explain the steps to reduce transmission and distribution losses. **(SUMMER 2022, 3 Marks OR; SUMMER 2023, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 4 Marks; SUMMER 2025, 3 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** State disadvantages of low power factor. Discuss any one method of Power factor improvements. / Explain effects of reduced power factor on electrical power system. / List out the Methods of Power factor improvements. / Explain power factor improvement using: i) Static Capacitors ii) Synchronous Condenser. / Explain the effect of low power system on electrical systems. / Explain causes of low power factor. **(SUMMER 2022, 3 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2024, 4 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Write a short note on automatic power factor controllers. / What is automatic power controller? Explain in details. **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks)**

3. Harmonics:

- **Q.** Explain the effects of harmonics and improvement methods. / Define Harmonics and explain causes of it. / Define harmonics & Explain harmonic reduction techniques. **(SUMMER 2023, 3 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks OR)**

4. Demand Side and Load Management:

- **Q.** Write a short note on Demand Side Management (DSM). / How energy conservation done by demand side management? / Discuss energy conservation by demand side management (DSM). **(SUMMER 2022, 7 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 7 Marks OR; WINTER 2023, 4 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** What do you mean by Load Management? **(SUMMER 2022, 4 Marks OR; WINTER 2024, 4 Marks)**

5. Motors, Soft Starters and Drives:

- **Q.** Describe technical aspects of energy efficient motors and energy saving by it. / State and explain characteristics of energy efficient motors. / What is energy efficient motor? How is it important? / Write a short note on "Energy efficient Motors" / What are the characteristics of energy efficient motors? Explain in details. / Explain opportunities of energy conservation while using electric motors. **(SUMMER 2022, 7 Marks OR; WINTER 2022, 3 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Write a short note on soft starter. / State advantages and application of soft starters. / Explain advantages of soft starter over conventional starters. / Explain need of starters both for a.c & d.c motors. / What is the significance of soft starter? How it is saving energy? **(WINTER 2022, 7**

Marks; SUMMER 2024, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 3 Marks; SUMMER 2026, 7 Marks OR)

- **Q.** Explain variable speed drives. / Write a technical note on: Variable Speed Drive (VSD) / How variable frequency drive is useful in energy conservation? **(WINTER 2022, 4 Marks; SUMMER 2024, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

6. Lighting and Residential Applications:

- **Q.** Discuss energy saving in lighting system. / Explain energy conservation using energy efficient lighting sources. / Explain energy conservation in commercial lighting system. / List advantages of electronic ballast. / Explain the procedure to save the energy of a lighting system. / Write advantages & disadvantages of L.E.D. / Describe energy saving using LED, soft starter and variable speed drive. **(SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 3 Marks OR; WINTER 2024, 4 Marks OR; SUMMER 2025, 4 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Explain steps for energy saving in any residential application. / Explain methods of energy conservation in house. **(SUMMER 2024, 4 Marks OR; SUMMER 2025, 3 Marks OR)**

Other Important Questions:

1. Energy Conservation Opportunities:

- **Q.** Explain energy conservation opportunities at generating stations. **(SUMMER 2026, 4 Marks OR)**

2. Case Studies:

- **Q.** Discuss Case Studies related to Power factor improvement in detail. **(SUMMER 2022, 7 Marks)**

Chapter 3: Thermal Systems

Repeated Questions:

1. Boilers:

- **Q.** Describe Water treatment and its impact on boiler losses. **(SUMMER 2022, 3 Marks OR; SUMMER 2023, 7 Marks; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** What are the advances in boiler technologies? **(SUMMER 2022, 4 Marks OR; WINTER 2023, 3 Marks OR; WINTER 2024, 4 Marks; WINTER 2025, 4 Marks)**
- **Q.** Write difference between FBC and PFBC boilers. / What is FBC Boilers? / What is FBC boiler? / Write a technical note on: Atmospheric Fluidized Bed Combustion system (AFBC). **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; WINTER 2023, 4 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 3 Marks OR; WINTER 2025, 4 Marks)**
- **Q.** Discuss heat recovery boilers with its limitations and constraints. **(SUMMER 2022, 7 Marks OR; WINTER 2024, 7 Marks OR)**
- **Q.** Explain intermittent blowdown and continuous blowdown in a boiler. / Explain benefits of blowdown in a boiler. **(SUMMER 2023, 3 Marks; SUMMER 2024, 7 Marks)**

2. Furnaces:

- **Q.** List factors affecting furnace performance. / List factors affecting furnace performance. Describe factors affecting fuel economy in furnaces. **(SUMMER 2023, 4 Marks; WINTER 2023, 7 Marks; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**
- **Q.** List out the Types and classifications of Furnace. / Give the types and classification of furnace. Explain any one in detail. / Enlist the classification of furnaces. / Define furnaces refractory- types & sections. / Define Furnaces refractory- types and sections. **(SUMMER 2022, 3 Marks; SUMMER 2022, 4 Marks; WINTER 2022, 7 Marks; WINTER 2024, 4 Marks OR; SUMMER 2025, 4 Marks)**

3. Waste Heat Recovery and Insulation:

- **Q.** Discuss the sources of waste heat and its potential applications. / What is waste heat recovery system? Explain its applications. / What is waste heat recovery system? State its advantages and disadvantages. **(WINTER 2023, 7 Marks OR; SUMMER 2025, 4 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Classify heat recovery systems and explain any one in detail. / Give the limitations of heat recovery. **(WINTER 2022, 3 Marks; WINTER 2025, 7 Marks OR)**
- **Q.** Write advantages and properties of thermal insulating material. / Give the hot and cold applications of insulator. **(WINTER 2022, 3 Marks; WINTER 2023, 3 Marks; WINTER 2025, 3 Marks OR)**

4. Steam Systems and Thermic Fluid Heaters:

- **Q.** Discuss Steam Utilization Properties, distribution and losses & steam trapping. / Write down properties of steam utilization. **(SUMMER 2022, 7 Marks; WINTER 2022, 3 Marks OR; WINTER 2024, 7 Marks; WINTER 2025, 4 Marks OR)**
- **Q.** What is the thermic fluid heater? Explain its need and application. / Write a technical note on Thermic Fluid Heaters. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks OR)**
- **Q.** Explain loss of steam energy in a piping network and methods to reduce it. / Explain scope of energy saving in steam distribution system. **(SUMMER 2023, 7 Marks OR; SUMMER 2026, 3 Marks OR)**

Other Important Questions:

1. Boilers:

- **Q.** Explain methods for performance evaluation in boiler system. **(SUMMER 2023, 7 Marks OR)**

- **Q.** Compare fire tube boiler and water tube boiler. **(SUMMER 2024, 3 Marks)**
- **Q.** Draw and explain schematic diagram for flow of water, steam and flue gases in a boiler plant. **(SUMMER 2024, 4 Marks OR)**
- **Q.** State and explain factors affecting the heat losses in boiler. **(SUMMER 2026, 3 Marks)**
- **Q.** List out essential qualities of a good boiler. **(WINTER 2024, 3 Marks OR)**

2. Furnaces:

- **Q.** Explain energy efficiency measures in furnace system. **(SUMMER 2024, 7 Marks OR)**
- **Q.** Explain direct method for finding thermal efficiency of furnace. **(SUMMER 2026, 7 Marks OR)**

3. Steam, Insulation and Co-generation:

- **Q.** Explain Flash steam recovery. **(WINTER 2022, 7 Marks)**
- **Q.** Discuss determination of Economic Thickness of Insulation (ETI). **(SUMMER 2026, 7 Marks)**
- **Q.** Explain need and principle of co-generation. **(SUMMER 2026, 3 Marks OR)**

Chapter 4: System Audit of Mechanical Utilities

Repeated Questions:

1. Pumps:

- **Q.** List out the Types and application of Pumps. / Explain types of pumps. / Define Pump. List various applications of pump. / Explain classification of pumps. **(SUMMER 2022, 3 Marks OR; WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks OR; SUMMER 2023, 4 Marks OR; SUMMER 2025, 3 Marks)**
- **Q.** Define Energy Saving in Pumps & Pumping Systems. / Explain energy saving in pumps. Also discuss the effect of oversizing the pump. **(SUMMER 2022, 4 Marks OR; WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks; WINTER 2024, 4 Marks; SUMMER 2025, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Explain the performance of pumps in parallel and series operation. / Write technical note on: Series and parallel operations of pumps. / Explain Head-Discharge characteristics for pumps operated in series and parallel. / Explain parallel operation of pumps. **(WINTER 2022, 4 Marks OR; SUMMER 2023, 7 Marks; WINTER 2023, 3 Marks OR; SUMMER 2024, 7 Marks OR; WINTER 2024, 3 Marks OR; SUMMER 2025, 7 Marks; SUMMER 2026, 4 Marks OR)**

2. Blowers:

- **Q.** List out the types, applications and advantages of blowers. / Explain various applications of blowers. / Give the types & application of blower. / List out the applications and advantages of blowers / Which are the various applications of blowers? **(WINTER 2022, 3 Marks OR; WINTER 2023, 4 Marks OR; SUMMER 2024, 3 Marks OR; SUMMER 2025, 3 Marks; SUMMER 2025, 4 Marks; WINTER 2025, 3 Marks OR)**
- **Q.** Describe various methods of energy conservation in blowers. / Discuss the energy conservation in blower. / Write short note on energy saving in blowers. **(SUMMER 2023, 7 Marks; WINTER 2023, 4 Marks OR; WINTER 2024, 7 Marks OR)**

3. Air Compressors:

- **Q.** Compare reciprocating and rotary air compressor. / Explain any 4 ways in which air compressors can be classified. / Explain applications of air compressor. / Write a short note on compressors. / What are advantages and disadvantages of compressed air system? **(WINTER 2022, 7 Marks OR; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Describe Energy Saving in Compressors & Compressed Air Systems. / Explain various methods for energy conservation in compressors. / Describe methods to improve performance of compressed air system. / Explain in detail various methods of Energy Conservation in Compressors. / Explain energy saving opportunities in air compressors. / Describe the methods to improve the performance of compressed air system. **(SUMMER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks OR)**

4. Cooling Towers:

- **Q.** Discuss components of Cooling Tower. / Write a short note on cooling tower. / Explain cooling towers. **(WINTER 2022, 7 Marks; WINTER 2024, 3 Marks; WINTER 2025, 3 Marks)**
- **Q.** Enumerate the energy saving opportunities in cooling towers. / Explain energy saving in cooling towers. / Enlist the parameters to evaluate the performance of cooling tower. / Write short notes on water loss in cooling tower. / List and explain main areas for improving the energy efficiency of cooling tower. **(SUMMER 2023, 3 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2025, 7 Marks OR; SUMMER 2025, 7 Marks OR; WINTER 2025, 4 Marks OR; SUMMER 2026, 3 Marks)**

Other Important Questions:

1. Blowers and Fans:

- **Q.** Give the different series & parallel operation of blower. **(WINTER 2022, 4 Marks)**
- **Q.** Explain fan efficiency with necessary mathematical equations. **(SUMMER 2024, 4 Marks OR)**
- **Q.** Explain performance assessment of blowers. **(SUMMER 2026, 3 Marks OR)**

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