K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class:TY	Program:B.Tech
Branch Code:MEC	Pattern:2022
Name of Course:Energy Audit and Management	Course Code:MEC223006B
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains _____page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Discuss the energy needs of growing economy and energy security importance.	(6)	1
Question No. 2			
2a)	Describe the main steps in planning an energy audit.	(6)	2
Question No. 3			
3a)	Write a short note on the energy saving opportunities in following utilities: 1. DG Set 2.HVAC system	(8)	3
	OR		
3b)	Why steam traps are used in steam distribution network? Enlist the types of steam traps and explain any one with neat sketch.	(8)	3
3c)	The initial speed of fan is 1200 RPM is reduced to 900 RPM. Also initial Q1=10000 m3/h, $\Delta p1$=500 Pa, P1=1.5 kW. Calculate final discharge, pressure head and power . Describe how energy can be saved in a fan system.	(8)	3
	OR		

3d) A boiler produces 7000 kg/hr of steam at 12 bar and 200°C using 470 kg/hr of oil (GCV=42,500 kJ/kg). Feed water enters at 60°C. Calculate the boiler efficiency using the direct method. (8) 3

Steam enthalpy at 12 bar, 200°C ≈ 2780 kJ/kg
Feedwater enthalpy at 60°C ≈ 251 kJ/kg

Discuss the various energy saving opportunities in the boilers

Question No. 4

4a) Explain the following terms of motors: (8) 4

1. Motor efficiency

2. Slip

3. Various losses in motors

A motor delivers 3 kW at 1500 rpm. Find the shaft torque (T) in N·m.

OR

4b) Discuss the measurement plan for the lighting energy audit. (8) 4

Also explain the terms Lux and luminous efficacy

4c) Compare the reciprocating air compressor with the screw compressor. (8) 4

Also discuss the measurement plan for the compressor performance assessment/audit.

OR

4d) Explain the following terms used in electric billing: (8) 4

1. KWh 2. KVA 3. TOD 4. Maximum demand 5. Contract Demand 6. PF

Question No. 5

5a) Explain the cogeneration system used in the sugar factory. (8) 5

OR

5b) Explain the cogeneration types with the example. (8) 5

5c) Explain the waste heat recovery concept with example. (8) 5

A heat exchanger recovers heat from flue gas to water.

- Water flow rate = 1 kg/s
- Water temperature rise = 25°C
- Cp of water = 4.18 kJ/kg·°C
- Total waste heat available in flue gas = 150 kW

Find: Heat recovered

Effectiveness of recovery

OR

5d) What do you mean by waste heat recovery? Explain the types of waste heat as per temperature range with examples. (8) 5

An economizer saves **40 kW** of waste heat.
It operates for **12 hours/day**.
Electricity cost = **₹8 per kWh**

Find: Daily energy saved (kWh/day)

Annual cost saving (₹/year)

····· End of question paper·····