

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:3161919****Date:14-07-2023****Subject Name:Energy Conservation and Management****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		<b>MARKS</b>
<b>Q.1</b>	(a) Define i) Renewable Energy ii) Non-Renewable Energy iii) Per Capita energy consumption	<b>03</b>
	(b) Define Energy Conservation and explain its importance.	<b>04</b>
	(c) Write short note on Energy Conservation Act-2001.	<b>07</b>
<b>Q.2</b>	(a) List benefits of Energy Monitoring and Targeting.	<b>03</b>
	(b) Differentiate between i) Simple payback period and Return on Investment ii) Energy Monitoring and Targeting	<b>04</b>
	(c) Write brief note on technique used to represent the difference between base line and actual energy consumption over the base line period of time with sample chart.	<b>07</b>
<b>OR</b>		
	(c) Explain role of the ESCOs in detail.	<b>07</b>
<b>Q.3</b>	(a) Define Energy Management and state its objective.	<b>03</b>
	(b) List factors affecting refrigeration and air conditioning system performance and explain any one from it.	<b>04</b>
	(c) List out key instruments used for energy audit and explain their function.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Define Energy Audit and explain its need in short.	<b>03</b>
	(b) Explain Economic thickness of insulation.	<b>04</b>
	(c) Classify Energy audit and explain the each phases of energy audit in detail.	<b>07</b>
<b>Q.4</b>	(a) Define Present value and Net present value.	<b>03</b>
	(b) Compare topping cycle and bottoming cycle for cogeneration.	<b>04</b>
	(c) The following data are collected for a boiler using furnace oil as the fuel. Calculate the efficiency of the boiler using indirect method. Ultimate Analysis: Carbon=84, Hydrogen=12, Nitrogen=0.5, Oxygen= 1.5, Sulphur= 1.5, Moisture= 0.5 GCV of fuel = 1000 Kcal/Kg, Fuel Firing Rate= 2648.125 Kg/Hr, Surface temperature of Boiler = 90 m <sup>2</sup> , Humidity = 0.025 Kg/Kg of dry air. Consider theoretical air required is 13.92 Kg/Kg of oil, Mass of dry flue gas 21.36Kg/Kg of oil.	<b>07</b>

Flue gas analysis: Flue gas temperature = 190 °C, Ambient temperature = 30 °C, CO<sub>2</sub>% in flue gas by volume = 10.8, O<sub>2</sub>% in flue gas by volume = 7.4.

Take Cp of flue gas as 0.23 KJ/KgK and of moisture/water content as 0.45 KJ/KgK.

**OR**

- Q.4** (a) Define Internal Rate of return (IRR) and state its advantages. **03**  
(b) Distinguish between Regenerative and recuperative type heat exchanger. **04**  
(c) Calculate efficiency of coal fired boiler using indirect method. **07**  
Boiler steam generation: 20 TPH, Steam pressure: 66 Kg/Cm<sup>2</sup>.  
Flue Gas: O<sub>2</sub> in flue gas = 9%, CO in flue gas = 800 ppm, Average Flue gas temperature = 180 °C.  
Atmospheric air: Ambient temperature: 29.3 °C, Humidity in ambient air: 0.01977 Kg/Kg dry air  
Fuel Analysis: Carbon = 53.65%, Hydrogen = 3.25%, Nitrogen = 1.11%, Oxygen = 8.68%, Sulphur = 0.34%, Moisture = 14.43%, Ash Content = 18.54%, GCV of Coal = 4291 Kcal/Kg.  
Consider theoretical air requirement is 7.0 Kg/Kg of coal and Actual mass of dry flue gas is 1.7 Kg/Kg of coal.  
Ash Analysis: Unburnt in bottom ash = 0.11%, Unburnt in fly ash = 4.89%, GCV of bottom ash = 889 Kcal/kg, GCV of fly ash = 395 Kcal/Kg. For moisture/water content in take Cp = 0.45 KJ/KgK & for flue gas Cp = 0.24 KJ/KgK.  
Also consider heat loss due to Radiation, convection and other unaccounted loss is 1.0%.

- Q.5** (a) Explain function of BEE. **03**  
(b) Give recommendation for efficient design of furnace. **04**  
(c) Explain Bachat Lamp Yojana, its aim and benefits. **07**

**OR**

- Q.5** (a) List out the various source of waste heat recovery. **03**  
(b) Summarize the practices to be followed for proper steam trap installation. **04**  
(c) Explain in brief about Clean Development Mechanism. **07**

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