

**[5254]-34**  
**B.E. (Mechanical)**  
**ENERGY AUDIT AND MANAGEMENT**  
**(2008 Pattern) (Elective - I)**

*Time : 3 Hours]*

*[Max. Marks : 100*

*Instructions to the candidates:*

- 1) *Figures to the right indicate full marks.*
- 2) *Solve questions 1 or 2, 3 or 4, 5 or 6 from section - I and 7 or 8, 9 or 10, 11 or 12 from section - II.*
- 3) *Answer to the two sections should be written in the separate books.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables and time value of money factor table is allowed.*
- 6) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Explain strategic measures for meeting the future energy requirements of India. **[8]**
- b) Differentiate between primary energy and secondary energy. Give two examples of each. **[8]**

OR

- Q2)** a) Write the responsibilities of energy auditor. **[8]**
- b) Explain energy security. **[4]**
- c) What is ABT? **[4]**

- Q3)** a) Explain stepwise procedure of detailed energy audit. **[8]**
- b) What are the energy conservation opportunities in Refrigeration and HVAC systems? **[8]**

OR

- Q4)** a) What is the need of energy audit? **[4]**
- b) What are the areas that need to be focused during pre-audit phase? **[6]**

**P.T.O.**

- c) Explain the following instruments used for energy audit with their application. [6]
  - i) Pitot tube
  - ii) Ultrasonic flow meter.

- Q5)**
- a) Explain the concept of Time value of Money. [6]
  - b) Explain the ROI financial analysis technique. What are the advantages and Limitations of ROI method? [6]
  - c) A sum of Rs. 25,000/- is deposited in a bank at the beginning of a year. The bank pays 6% interest annually. How much money is in the bank account at the end of the fifth year, if no money is withdrawn? [6]

OR

- Q6)**
- a) Explain the Internal rate of return (IRR). What are the advantages and disadvantages of IRR? [6]
  - b) Calculate Net present Value of a project at a discount rate of 15% with an Investment of Rs. 50,000 at the beginning of the first year, & saving of Rs. 23,000 & Rs. 36000 at the end of the first & second year respectively. [8]
  - c) Explain simple payback period. What are the limitations of it? [4]

### **SECTION - II**

- Q7)**
- a) What are advantages and disadvantages of direct method of efficiency calculation for Boiler? Explain indirect method of efficiency calculation. [10]
  - b) Calculate the pump efficiency from the data given : pump flow is  $0.40\text{m}^3$ , power absorbed : 325 kw, suction head + 1m, Delivery Head 55m, motor efficiency 88%, Type of drive direct coupled, Density of water  $996\text{kg/m}^3$ . [8]

OR

- Q8)**
- a) How furnace efficiency is calculated? Explain different heat losses in fuel fired furnaces. [10]
  - b) Explain energy saving opportunities in pumping system. [8]

**Q9) a)** The lighting connected load for the small industry consisting of 150 Fluorescent tubes of 55W each with magnetic ballast. In first option, the magnetic ballast of Fluorescent tubes is replaced by electronic ballast and power consumption of same fluorescent tubes reduces to 40W. Calculate the Simple payback period of above replacement if cost of electronic ballast is Rs 105. In second option, fluorescent tubes are replaced by energy efficient fluorescent tubes of 20W and cost of Rs. 400 each. Calculate simple payback period. Which energy saving option is better and Why? Consider usage of 16 hours per day and an electrical tariff of Rs. 4 per KWh. [8]

b) Explain energy efficient motors. How motor selection is done? [8]

OR

**Q10)a)** Explain the terms : [8]

- i) Copper losses
- ii) Luminous efficiency
- iii) Ballast
- iv) Power factor

b) Explain the different maximum demand (MD) control methods. [8]

**Q11)a)** What are the different waste heat sources? Explain in brief. [8]

b) Explain the topping cycle and the bottoming cycle of cogeneration with two examples. [8]

OR

**Q12)Write Notes on :** [4 ×4 = 16]

- a) Heat wheel
- b) Heat pipe
- c) CDM projects
- d) Carbon credit

