Total No. of Questions : 12] **SEAT No. :**

P3046 **[Total No. of Pages : 3**

[5354]-534
B.E. (Mechanical)
ENERGY AUDIT & MANAGEMENT
(2012 Pattern) (Elective - I) (Semester - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Draw Neat diagrams wherever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Explain current energy scenario in India. **[5]**

b) Write short note on **[5]**

i) Greenhouse Effect

ii) Energy Security

OR

Q2) a) Explain the need of renewable energy. **[5]**

b) Explain the principles of energy management. **[5]**

Q3) a) What is energy audit? Explain the need of energy audit. **[5]**

b) Explain the different instruments used for energy audit. **[5]**

OR

Q4) a) Explain detailed energy audit with 10 step methodology. **[6]**

b) What are the different energy conservation opportunities in furnace? **[4]**

P.T.O.

Q5) a) Explain in short with advantages **[5]**

i) Time value of money

ii) Sensitivity analysis

b) Cost of a heat exchanger is Rs. 1.00 lakh. Calculate simple payback period and ROI by considering annual saving potential of Rs. 60,000/- and annual operating cost of Rs. 15,000/-. **[5]**

OR

Q6) a) Annual saving after replacement of a boiler for 1st year is Rs. 6.5 lakhs, for 2nd year is Rs. 6.0 lakhs and for 3rd year is 5.25 lakhs respectively. Total Project cost is Rs. 12 lakhs considering cost of capital as 12%, if boiler requires Rs. 1.2 lakhs for maintenance per year, what is the NPV of proposal. Is proposal attractive? **[5]**

b) Calculate the internal rate of return for an economizer that will cost Rs. 500,000, will last 10 years and will result in fuel saving of Rs. 150,000 each year. **[5]**

SECTION - II

Q7) a) Enlist and discuss the energy saving methods for pumping system. **[7]**

b) Find out the efficiency of the boiler by direct method with the data given below: **[6]**

i) Type of boiler: Coal fired

ii) Quantity of steam (dry) generated: 8 TPH

iii) Steam pressure (gauge) / temp: 10 kg/cm^2(g)/ 180 °C

iv) Quantity of coal consumed: 1.8 TPH

v) Feed water temperature: 85 °C

vi) GCV of coal: 12000 kJ/kg

vii) Enthalpy of steam at 10 kg/cm^2 pressure: 1785 kJ/kg (saturated)

viii) Enthalpy of feed water: 320 kJ/kg

OR

Q8) a) Explain with neat sketch the steam distribution system. **[6]**

b) A centrifugal pump is pumping 60 m^3/hr of water and pressure rise in pump is 7 kg/cm^2 (gauge). If power drawn by motor is 25 kW. Find out the pump efficiency. Assume motor efficiency 90 % and water density as 1000 kg/m^3. **[7]**

Q9) a) What is power factor? What are the benefits of improving power factor? **[7]**

b) Explain electrical tariff structure for an industrial consumer. **[6]**

OR

Q10) a) What are the types of lamps used in lighting system? Write down their features with typical applications. **[7]**

b) The connected loads for shop are as below. **[6]**

i) 15 bulbs of 60W each

ii) 10 Fluorescent tubes of 40W each

iii) An old fan of 250W

It is decided to replace the bulbs and tubes with 30 CFL of 20W each and an old refrigerator by energy efficient refrigerator of 150W. Considering usages of 10 hours per day and an electrical tariff of Rs. 4.00 per kWh. Calculate an annual electrical energy saving and cost.

Q11) a) What is cogeneration? Write down principles of cogeneration and its advanges. **[8]**

b) Explain in brief **[6]**

i) CDM project

ii) Carbon credit calculation

OR

Q12) a) Explain with neat diagrams the cogeneration systems using the back-pressure turbine, extraction-condensing turbine and double extraction back pressure turbine. **[8]**

b) Explain the concept of waste heat recovery? Explain Convective Radiative Recuperator with neat sketch. **[6]**