15/05/19

Register no

[F·T]

B.E DEGREE END-SEMESTER EXAMINATIONS, APRIL-MAY 2019

MECHANICAL ENGINEERING, MECH-T

SEMESTER: VII

ME8075- Energy Conservation In Industries

REGULATION 2012

(Assume suitable data wherever required and mentioned it clearly)

Time: 3 Hours

Max Marks: 100

ANSWER ALL QUESTIONS

Part-A (10*2=20)

1. Name few energy intensive industries?
2. What is preliminary audit?
3. What do you understand by demand charges?
4. What are harmonics and how are they generated?
5. Define critical thickness of insulation.
6. What is the function of steam trap?
7. What do you mean by COP of a refrigeration system?
8. What is the importance of Fills in cooling towers?
9. What is net present value?
10. What is IRR?

Part – B (5 x 16 = 80 marks)

(Question No.11 is Compulsory)

11. a) Explain the present national energy scenario of conventional and renewable sources of energy utilisation. (16)

12. a) i. Explain the various action required to perform a detailed electrical energy audit in any industry (8)

ii. What are the energy conservation options feasible in lighting systems and electrical motors. (8)

(OR)

b) i. Describe the roles and responsibility of an Energy Auditor. (8)

ii. Barriers for Energy Audit – cum – Energy Conservation in an industry. (8)

13. a) The following are the data collected for a typical oil-fired boiler. Find out the efficiency of the boiler by indirect method. (16)

Ultimate analysis of oil

C: 84.0 %, H_2: 12.0 %, S: 3.0 %, O_2: 1.0 %, GCV of oil: 10,200 kCal/kg
Steam generation pressure: 7 kg/cm^2 (g)-saturated
Enthalpy of steam: 660 kCal/kg
Feed water temperature: 60° C
Oxygen in flue gas: 7 %
CO_2 in flue gas: 11 %
Flue gas temperature (T_f): 220 ° C
Ambient temperature (T_a): 27 ° C
Humidity of air: 0.018 kg/kg of dry air

(OR)

b) i. Describe Thermal fluid heaters with proper sketch. (8)
ii. Explain with a neat sketch the functioning of Inverted Bucket steam traps with proper illustration. (8)

14 a) i. Define EER for a Refrigeration System. (6)

ii. A cooling tower is cooling 450 lps of water from 45° C to 37.5° C at a WBT of 29° C. The CT fan air flow rate in 1 miilion m^3/h. (σ_{air} = 1.2 kg/m^3) and operates at COC of 2.7. Estimate the evaporation loss and Blow Down quantity. (10)

(OR)

b) i. What is the energy saving measures to be taken for DG set? (6)
ii. Write a note on Simple payback period. (4)
iii. Explain the difference between fans, blowers and compressors? (6)

15 a) A process plant requires 28 tons of steam per hour and 2250 kW of electric power. The plant operates for 8000 hours per annum. Steam is generated at 2 bar(g) in a coal fired boiler with an efficiency of 75 %. The feed water temperature is 80° C. The calorific value of coal is 4000 kcal/kg. The cost of coal is ₹ 2000/ton. Power is drawn from the grid at ₹ 4 kWh. The contract demand is 3000 kVA with the electricity supply company and the plant is charged for 100 % of the contract demand at ₹ 300/kVA/month. The plant has never exceeded its contract demand in the past.

The plant is planning for a back pressure cogeneration system using the same coal with the following parameters. The power and steam demand are to be fully met by cogeneration plant and a contact demand of 1000 kVA with the grid is to be kept for emergency proposes.

Find out the IRR over a project life cycle of 6 years for the proposed cogeneration system.

Cogeneration System data:

Boiler generation pressure:	18 bar(g), 310° C
Boiler efficiency:	79%
Investment required:	₹ 20 crores
Generated power:	2250 kW

Steam enthalpy data:

Total enthalpy at 2 bar (g):	647.13 kcal/kg
Total enthalpy at 18 bar (g), 310° C:	730.28 kcal/kg

(OR)

15b) i. A company invests ₹ 10 lakhs expecting a return of ₹ 2.5 lakhs/year. What is IRR? (8)

ii. Explain in detail ESCO and its types. (8)