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**B.E / B.Tech ( Full Time ) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013**

**B.E. ( Mechanical Engineering )**

**Eighth Semester**

**ME 9021 ENERGY CONSERVATION & MANAGEMENT**

**( Regulation 2008 )**

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

**PART – A ( 10 x 2 = 20 Marks )**

1. How Energy Conservation and Environment Upgradation are related ?
2. Define : Primary & Secondary Energy Sources.
3. What is an Energy Efficient Window ?
4. State the function of an "Occupancy Sensor"
5. How excess air used for combustion of a fuel can be estimated when  
(a) O<sub>2</sub> % (b) CO<sub>2</sub> % in flue gas is given.
6. Explain the terminology : Boiler steam output is 6 tons / h, F & A 100°C.
7. State 4 methods of Air Volume Control in a Blower.
8. How the effectiveness of a Heat Exchanger can be expressed ?
9. List the components of "Life Cycle Cost" of an utility
10. State the functions of a Energy Management Information System

**Part – B ( 5 x 16 = 80 marks )**

11. Write notes on the following : (16)
  - Energy Accounting Systems practiced in Industries
  - Elements of Detailed Energy Auditing
  - Barriers for Energy Audit
  - Sankey Diagram with an example
12. a) (i) In a 25 kVA transformer, the iron and full load losses are 350 W & 400 W respectively. Establish the efficiency of operation of the Transformer at **Full Load & Unity Power factor** and **Half Full Load & 0.8 PF**. Also determine the transformer load at which the efficiency will be maximum (10)
- (ii) Write on any 3 types of Lamps commonly used in commercial establishments indicating their **merits and limitations**. (6)

**OR**

- b) (i) A 10 hp, 415 V, 4 pole 50 Hz squirrel cage induction motor has a full load efficiency of 89.5 % at a Power Factor of 0.9. (8)  
The data measured by an Energy Auditor is as below :  
Voltage = 410, Current = 9.5 A, PF = 0.80, Speed = 1480 rpm,  
Supply Frequency = 49.8 Hz  
Find Power Input to the Motor, % Motor Loading & % Slip
- (ii) Write on the following : (8)
  - Power Factor Correction
  - Losses taking place in a motor

13. a) Elaborate the following with reference to boiler operation : (16)
- Advantages of steam as a heat transfer medium
  - Indirect method of boiler efficiency determination
  - Blow down in boiler operation
  - Types & Functions of Steam Trap

OR

- b) (i) Explain the concept : Economic Thickness of Insulation in steam distribution systems (5)
- (ii) Write on "Pinch Analysis" (6)
- (iii) The E R ( Evaporation Ratio ) of a coal fired boiler is 4.2. Estimate the Boiler Efficiency ( Steam Enthalpy : 2 670 kJ / kg ; Feed Water Temp : 55°C ; Coal Calorific Value = 16 700 kJ / kg ) (5)

14. a) (i) In an A/c System of 10 TR capacity, air enters the cooling coil at 25°C ( 19.5°C W B T ) and leaves at 15°C ( W B T = 10 °C ) (10)  
Establish the Air Quantity supplied, CoP, EER and Specific Power consumption if the motor power input is 15 kW ( motor  $\eta$  = 88 % )
- (ii) Evolve a procedure for estimating Free Air Delivery ( F A D ) of an Air Compressor using **Pump – Up** method. (6)

OR

- b) (i) Draw the characteristic curve of a Blower (5)
- (ii) What are the possible causes for a higher power consumption in Pumps? Explain (6)
- (iii) Show with a neat sketch the working principle of a Heat Pipe (5)

15. a) (i) A factory has plans of recovering waste heat from a thermal source. There are 2 options available to the factory termed option 1 and option 2. The economics of the options are as below. Suggest the better option. ( Life time of each option is 6 years ) [ Hint : Use I R R method ] (8)

Option	Initial Investment Rs lakhs	Annual Income lakhs Rs / y
1	5	1.8
2	8	2.6

- (ii) Define Depreciation. The Capital Cost of a road laying machine is Rs 30 lakhs. Its salvage value after 5 years is Rs 50 000. The length of the road that the machine can lay in its lifetime is 75 000 km. The length of road laid during 3<sup>rd</sup> year of operation is 3 000 km. Find the depreciation of the equipment for the 3<sup>rd</sup> year. (8)

OR

- b) Write brief note on (16)
- Advantages of Waste Heat Recovery concept adoption
  - Cost and Energy Index of a plant
  - Standards and Labeling of Energy Utilities
  - Financing of Energy Conservation project through ESCO Concept