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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

MECHANICAL ENGINEERING

VIII Semester

ME 514 / ME 9021 ENERGY CONSERVATION AND MANAGEMENT

(Regulation 2004 / 2008)

Use of Steam Table is permitted

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Define the Terminology ToE in relation to energy usage in a country.
2. A 210 MW power plant produces annually 1.5 million MWh of power. What is the Plant Load Factor (P L F) ?
3. State the ill effects of Harmonics (Mention atleast 4).
4. State the importance of carrying out **Power Quality Audit** in an industry.
5. Describe **Pinch Point**.
6. Write down the equation for **Critical Insulation Thickness** and brief.
7. Write the method adopted for estimating leakage in a Compressed Air Systems.
8. Define : C o P and E E R in a Refrigeration System.
9. State 2 important functions of EMIS. [Energy Management Information System]
10. What is the role of an ESCO (Energy Service Company) in the implementation of ENCON Schemes in an industry ?

Part – B (5 x 16 = 80 marks)

11. Write on the following :
 - i) How Energy Conservation & Environment are related ? (3)
 - ii) Differentiation of Preliminary Energy Audit & Detailed Energy Audit (5)
 - iii) Barriers for Energy Audit – cum – Energy Conservation in an industry (4)
 - iv) Role of Bureau of Energy Efficiency (B E E) in India (4)
12. a)
 - i) State the criteria at which the efficiency of a Transformer will be maximum (3)
 - ii) List the advantages of LED lighting over other commonly used Lamps (8)
(say Incandescent Bulbs / Fluorescent Tube Lights)
 - iii) Enumerate the concept of "Demand Side Management" in an industry (5)

(OR)

- b)
 - i) List the 5 major losses taking place in a motor and brief (5)
 - ii) The average Power Factor (PF) of an industry is 0.70 with an average kW of 650. How much kVAR is required to improve the PF to 0.90 ? (5)
 - iii) How Variable Frequency Drive (V F D) helps in achieving Energy Conservation ? (3)
 - iv) Differentiate : Lux & Lumens (3)

13. a) i) A process plant needs 10 tph of Saturated Steam at 7 ksc (a) pressure from a Boiler. Feed Water inlet temperature is 40°C. Find the Boiler Rating F & A 100°C (6)
- ii) State the advantages of **Condensate Recovery** in a process plant (6)
- iii) Name 2 major losses occurring in fuel combustion in a boiler and elaborate (4)

(OR)

- b) Write on the following :
- i) Boiler Derating (3)
- ii) Method to find "Excess Air" used in Combustion (2)
- iii) Blow Down - Need for it (3)
- iv) Economizer & Air Preheater : State their functions and which of these two will be bigger in size and why ? (4)
- v) Functions of a Steam Trap (4)
14. a) i) Name the 2 most important parameters to be considered in the selection of a pump and explain (4)
- ii) Show by a worked example that operating cost of a Blower far exceeds its investment cost on Life Cycle cost analysis basis. (6)
(Assume suitable values if needed)
- iii) Show with a sketch the working principle of a **Heat Pump** (6)

(OR)

- b) i) Write down the equation for measurement of Air Flow in a duct using Pitot Tube (5)
- ii) Explain Technically why a higher temperature at Evaporator & lower temperature at Condenser are preferred in a Vapour Compression Refrigeration (V C R) System from Energy Conservation point of view ? (6)
- iii) How **Heat Wheel** and **Recuperator** are differentiated in their basic principle of operation ? (5)
15. a) i) Mention a few drawbacks of Payback Financial Analysis method in evaluating the economic viability of an energy conservation scheme. (5)
- ii) How Energy Utilization Index and Cost Utilization Index are defined ? (5)
- iii) Write briefly on the concept **Energy Resources Management** w.r.t an industry (6)

(OR)

- b) i) A building consumes 1.8 million kWh of electricity and 2 00 000 m³ of Natural Gas annually. If cost of power is Rs 5.80 / kWh and that of gas is Rs 12 / m³, estimate the EUI (Energy Utilization Index) and ECI (Energy Cost Index) of the building which has an area of 10 000 m² (6)
- ii) Mention the concept of Depreciation in a Financial Analysis (4)
- iii) Find the IRR for the following : (6)
Capital Investment : Rs 12 lacs

Cash inflow	Year	1	2	3	4	5	6	7
	Rs (lacs)	2	2	2.5	3.5	3.0	2.5	2.0