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FACULTY OF ENGINEERING AND TECHNOLOGY

Third Engg (EEP/EE/EEE) Examination - DEC – 2014

Energy Conservation and Audit (Revised)

[Time: THREE *Hours*] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B
1) Q. no 1 and 6 are compulsory
2) Attempt any two questions from section A & B each from remaining.
3) Assume suitable data if required.

SECTION A

Q.1 Attempt any five objective questions 10

1) Which among the following has the lowest Global-warming-potential ?
   a) Perflurocarbon
   b) CFCS
   c) Methane
   d) Nitrous oxide.
2) Define ton of refrigeration
3) What is meant by Evaporation ratio in case of steam boiler?
4) Give the definition of energy audit, as per the energy –conservation act-2001
5) If the percentage of oxygen in flue gas is 7%, calculate the excess air required for combustion
6) Draw the schematic diagram of bottoming –cycle co- generation.
7) Write the statement of second law of thermodynamics.
8) How much CO2 emissions in tons would be reduced annually by replacing 60 watts incandescent lamp with a 15 watt CFL, if CO2 emission is 1kg CO2 per kWh, and annual burning is 3000 hours?

Q.2
a) What are the duties and responsibilities of energy manager as per energy conservation Act-2001? 07
b) List the objectives of carrying out energy- audit. Explain various steps involved in carrying out energy- audit of an industrial organization. 08

Q.3
a) Explain in detail the steps to calculate boiler efficiency by indirect method. 10
b) List out 5 energy conservation opportunities in Boiler-plant of a thermal power station. 05

Q.4
a) What is co-generation? With the help of diagram explain 08
   i) Back pressure turbine
   ii) Extraction condensing turbine co-generation systems.
b) Explain "Affinity Laws" applicable to pumping systems, and list the energy conservation opportunities in pumping system in an industry. 07

Q.5 Write short notes on any three 15

a) Energy conservation Act-2001
b) Role of Renewable energy sources in energy management of a nation.
c) Clean development mechanism and its objectives.
d) Energy performance assessment of HVAC & refrigeration system.

SECTION B

Q.6 Attempt any five 10

1) If the maximum demand of a factory is 3500 KVA at 0.88 P.F. The max. Demand will reduce by ----------KVA, if the P.F. is improved to 0.98.
2) The power input to a rotor of 3 phase induction motor is 42.3 kw. If the I.M. is operating at a slip of 1.3% the total mechanical power developed will be ----------kw.
3) The retrofitting of a variable speed drive in a plant costs. Rs.2 lakh. The annual savings is Rs.0.5 lakh, the maintenance cost is Rs.5000/year. What will be the return on investment?
4) Define NPV- giving the standards formula to calculate net present value.
5) What is IRR?
6) What is meant by profitability index for energy conservation projects?
7) Calculate the fixed energy consumption for a rolling mill consuming 3, 00,000 units electricity to produce 500 MT products per month and having specific energy consumption of 500 kwh/MT.
8) A 4 pole squirrel cage IM. Operates with 5% slip at full load. What is the full load RPM you may expect if the frequency is changed to 45C/S by a V/f control.

Q.7 a) Explain in detail the importance of power factor in energy conservation program. 08

b) An industrial plant is consuming 400 KW power with a maximum demand of 520 KVA. The demand charge is Rs. 300 /KVA per month .determine the savings possible by improving the P.F. to 0.95 and payback period if investment on capacitor bank is Rs. 3,00,000/- 07

Q.8 a) Give comparison between NPV and IRR method of financial analysis for energy conservation projects. 07

b) It is proposed to install a heat recovery device in a process industry the capital cost is Rs.2,00,000=00 and after 5 years the salvage value is to be Rs. 15,000=00. The savings are as given below, determine the NPV after 5 years for a discount rate of 8% 08

Year	1	2	3	4	5
Saving Rs.	70,000	60,000	60,000	50,000	50,000

Q.9 Explain in detail the procedure to conduct the energy audit of a typical thermal power plant. Which instruments are required for performance evaluation of TPS? Suggest measures to be taken to improve the overall performance of TPP. 15

Q.10 Write short notes on (any three) 15

a) Advantages of demand side management.
b) ISO 50,001-energy management system
c) E.A.2003 and Energy sector reforms.
d) Electricity tariff-applicable to industrial consumers.