

Q. P. Code: 27488**Energy Management****(3 Hours)****[80 Marks]****N. B. :**

1. **Question no.1 is compulsory.**
2. Attempt any **THREE** from question no. 2 to 6.
3. Use illustrative diagrams wherever required.

- Q1)** Attempt any *four*
- a) Using Sankey diagram explain energy consumption pattern of India 05
 - b) A three phase induction motor is drawing 16 Ampere at 440 Volts. If the operating power factor of the motor is 0.90 and the motor efficiency is 92%, then find the mechanical shaft power output of the motor. 05
 - c) What is the role of an Energy Manger and Energy Auditor? 05
 - d) How do an Industry, Nation and World would benefit from energy efficiency programs? 05
 - e) Explain the terms EER and LOLP. 05
- Q2)**
- a) i) Explain energy conservation opportunities in Pumps and fans. 10
ii) What are the differences of AC current and DC current?
 - b) Write short note on the followings 10
 - i) Electricity Act 2003
 - ii) Concept, Need and Principles of VFDs
- Q3)**
- a) Define Waste Heat Recovery. What are the benefits? State various WHR systems and briefly explain with neat sketch, operation of a regenerator for WHR. 10
 - b) Calculate the SPP and NPV over a period of 3 years for a project with the following data. The discount rate is 12%. What will be the IRR for the entire life of project. 10

Year	Investment (Rs.)	Savings (Rs.)
0	75,000	0
1	0	25,000
2	0	75,000
3	50,000	75,000
4	0	35,000

[TURN OVER]

- Q4) a)** A concentric pipe heat exchanger for water heating uses hot process liquid flowing at $10 \text{ m}^3/\text{hr}$. This liquid enters heat exchanger at 180°C and leaves at 125°C . Water entering at 30°C and leaves at 90°C . Calculate heat transfer area in parallel as well as counter flow case. State your comment regarding heat transfer area. Take overall heat transfer coefficient as $820 \text{ W/m}^2\text{K}$. 10
- b)** Distinguish between 'Preliminary Energy Audit' and 'Detailed Energy Audit'. Give a typical energy audit format. 10
- Q5) a)** ABC college of engineering uses DG set as a switchover in case of power outage for one hour. Calculate the per unit cost of electricity produced by DG set. 10
 Following data refers to DG set
 Rated Power = 128kW , 0.8pf , 1500rpm
 Sp. Energy at full load = 3.3kWh/Lit of fuel
 Cost of Fuel = Rs. $68/\text{Lit}$.
 If DG set is to be replaced by Solar PV, then a 1kW Solar PV system installed on building with a daily sunshine of 5 Hrs will generate how much electricity/month?
- b)** Why excess air is required? Explain importance of flue gas monitoring in boilers 05
- c)** One unit of electricity in end-use application is equivalent to about two units of electricity generated. Substantiate your answer with the computation of cascade efficiency from generating plant ex-bus to end-use application. 05
 Assume: Efficiency of Generator yard substation as 98% ;
 Transmission and Distribution Loss = 20% ;
 Efficiency of End-use application = 65% .
- Q6) a)** Explain Present value and Time value of Money 05
- b)** Power Factor at the load side is 0.75 and average minimum load is 100kW . What is the kVAR rating of capacitor to improve the power factor at the load side to 0.95 05
- c)** Write short note on the following 10
 i) Heat Wheel and Heat Pipe
 ii) Cogeneration: Its need, classification and application