Time: 3 Hours **Total Marks: 80**

N. B.:

1. **Question no. 1 is compulsory**
2. Attempt any **THREE Questions** from remaining **FIVE** questions.
3. Use illustrative diagrams wherever required.

Q1) Attempt any **FOUR** questions**.**

a)	Give examples of energy conservation and energy efficiency.	**05**
b)	Define 1) Energy management 2) Energy audit.	**05**
c)	List energy Conservation opportunities possible at home.	**05**
d)	List thermal systems that require energy management practices on regular basis.	**05**
e)	Explain the importance of data collection in energy auditing?	**05**

Q2) **a)** Distinguish between 'preliminary energy audit' and 'detailed energy audit'. **10**

b) What are advantages of NPV method over Simple Payback Period method? Calculate net present value (NPV) for an investment towards a LED Lamp having life of 2 years. The discount rate is 10% per year. The cost of lamp is ₹400/_. Due to investment, annual savings in first year and second year is ₹1000/_ each. **10**

Q3) **a)** What are the benefits of Power Factor (PF) improvement? **10**
During June-2019, the plant has recorded a maximum demand of 600 kVA and average PF is observed to be 0.82 lag, the minimum average PF to be maintained is 0.92 lag as per the independent utility supplier and every one % dip in PF attracts a penalty of Rs 10,000/in each month. Calculate **new kVA and the improvement in PF** for July-2019 by installing 100 kVAr capacitors.

b) Explain the features of "energy efficient motor". Why it is preferred over "standard motor"? **10**

Q4) **a)** Why dry saturated steam is preferred for heating applications? What are the uses of steam in the industry? **10**

b) List any **TEN** Energy Conservation opportunities possible in HVAC system. **10**

Q5) **a)** MSEB decided to replace 400 W lamp with 250 W lamp, 250 W lamp with 150 W lamp and 125 W lamp with 70 W lamps for same light output for 4500 hours of annual operation and consider Rs. 4.5 as per unit cost. Calculate **energy savings, cost savings and simple payback period** due to investment decision. **10**

b) The specifications of cooling water pump connected to boiler, are as follows: Discharge- Q = 12.5 lit/sec, head- H = 60m, Power consumption- P = 13.4 kW. **10**

As per the boiler manufacturer, required quantity is 12.5 lit/sec at 3.0 kg/cm^2. What type of energy conservation measure can be proposed and estimate the **reduction in power consumption**?

Assume operating efficiency of pump as 65% and motor efficiency as 90%.

Q6) **a)** What do you mean by **ECBC**? Enlist any **FIVE** energy saving measures possible in hospital building. **10**

b) What is LEED rating of a building? How it is implemented in India? **10**
