B.E. Mechanical Engineering - Third Year - Second Semester
Energy Conservation And Management

Time: 3 hours Full Marks: 100

Answer any **five** questions
Answer must be brief. **All parts of the same question must be answered together**
Assume any suitable data
Use of property tables and charts allowed

1. Explain if following statements are true or false with reasons (**in maximum five sentences**)

   a) 'Energy conservation means energy use reduction.'
   b) 'Energy intensity is an indication of energy use pattern of a country.'
   c) 'Renewable energy use helps energy conservation.'
   d) 'Shorter payback period for a waste heat recovery equipment installation is always preferred.'
   e) 'Amount of available waste heat is more important than its temperature.'
   f) 'Efficiency of a CCGT plant always increases with number of pressure of steam generation.'
   g) 'Supplementary firing in a CCGT plant always increases both efficiency and power output.'
   h) 'EUF is better than FESR for evaluation of the performance of a CHP plant.'
   i) 'Any non-commercial energy may be a commercial energy in future.'
   j) 'Installing waste heat recovery equipment is a short-term measure for energy conservation.'

   10x2=20

2. a) How climate change is related to energy conservation? Which one is a more difficult challenge and why? Does sustainable development mission include both of these? Explain. 4+2+4=10
   b) What are the most important fossil fuels in the earth? Are these only available fossil fuels on earth? Then why these are most important? In a table write two advantages and two limitations of each of these important fuels. 3+1+2+4 = 10

3. a) Define energy security. State four actions for better energy security. 1+4=5
   b) What is electric grid? Does it contribute to energy conservation? If yes, how? 2+1+2=5
   c) State five benefits of energy conservation. 5
   d) What is the central nodal agency of India for energy conservation? What is the mission of that agency? State three salient activities of that agency. 1+1+3=5

4. a) Derive the expression for combined efficiency of two heat engines in series with loss of heat (as a fraction of total input). 05
   b) Show the classification of CCGT 05
   c) Why two-pressure system is better than single-pressure steam generation in a CCGT. Describe a two-pressure CCGT with a layout diagram. 10

5. a) What is cogeneration? Show the schematic of a basic heat engine and a cogeneration. 1+4=5
   b) Show the schematics of a condensing-extraction and a back-pressure turbine for cogeneration with proper labelling. In a table state the suitable application areas of these two cogenerations. 3+3+4=10
   c) Write the expression of artificial thermal efficiency explaining all terms. Why is it efficiency but artificial? 2+3=5

6. a) Define 'waste heat'. Show with block diagrams the scope for waste heat recovery in an industrial plant. 02+ 03 = 05

b) Explain the working principle of a heat pipe element. Are thermo-siphons and heat pipes same? 08+02 = 10

c) What is Pay Back Period? Should be low or high? 03+02 = 05

7. Write short notes on:
a) Availability based tariff, b) Heat wheels, c) PAT scheme, d) Power tariff of India 5x4=20