

**Total No. of Pages : 02**

**Total No. of Questions : 09**

**B.Tech.(Aerospace Engg.) (2012 Onwards) (Sem.-4)**

# THERMODYNAMICS

**Subject Code : ANE-205**

**M.Code : 60513**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

## SECTION-A

**1. Answer briefly :**

- Define reversible process.
- What is thermodynamic equilibrium ?
- Define mechanical equivalent of heat.
- Define control volume.
- Write steady flow energy equation.
- What is thermal reservoir ?
- Define air standard efficiency.
- Write the equation of state of a gas.
- Define latent heat.
- What is Gibb Phase rule ?

**SECTION-B**

2. What is the difference between intensive and extensive properties ? What is a quasi-equilibrium process ? What is its importance in engineering ?
3. A fan is to accelerate air to a velocity of 10 m/s at a rate of 4 m<sup>3</sup>/s. Determine the minimum power that must be supplied to the fan. Density of air = 1.18 Kg/m<sup>3</sup>.
4. A steam power plant with a power output of 150 MW consumes coal at a rate of 60 tons/h. If the heating value of the coal is 30,000 kJ/kg. Determine the overall efficiency of this plant.
5. An insulated piston-cylinder device contains 5L of saturated liquid water of a constant pressure of 150 kPa. An electric resistance heater inside the cylinder is now turned on, and 2200 kJ of energy is transferred to the steam. Determine the entropy change of the water during the process.
6. How do actual vapour power cycles differ from idealized ones ? Compare the pressures at the inlet and the exit of the boiler for (a) actual and (b) ideal cycles.

**SECTION-C**

7. How does a diesel engine differ from a gasoline engine? How does the ideal cycle (Diesel) differ from the ideal otto cycle? What is cutoff ratio? How does it affect the thermal efficiency of a Diesel cycle ?
8. Explain how a real-gas mixture can be treated as a pseudopure substance using Kay's rule.
9. Air is used as the working fluid in a simple ideal Brayton cycle that has a pressure ratio of 12, a compressor inlet temperature of 300 K, and a turbine inlet temperature of 1000 K. Determine the required mass flow rate of air for a net power output of 70 MW. Assuming both compressor and turbine have an isentropic efficiency of :
  - a) 100%
  - b) 85%. Assume constant specific heats at room temperature.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**