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Total No. of Questions: 09

Total No. of Pages: 02

**B.Tech. (ME) (Sem. 3)**  
**APPLIED THERMODYNAMICS - I**  
**Subject Code: ME-209**  
**Paper ID: A0805**

Time: 3 Hrs.

Max. Marks: 60

**INSTRUCTIONS 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. Write briefly:

- a) What is effect of blade friction on flow of steam?
- b) What are the essentials of a good steam boiler?
- c) What is meant by saturation temperature and saturation pressure?
- d) Distinguish between air cooled and water cooled condensers.
- e) What is compression ratio?
- f) What is the function of boiler chimney?
- g) Define equivalent evaporation and boiler efficiency.
- h) Explain the purpose of feed water heating (bleeding).
- i) Why compounding of turbines are essential?
- j) Define heat rejection ratio.

**SECTION B**

2. Define:

- a) Heat of formation
- b) Enthalpy of formation
- c) Enthalpy of reaction
- d) Adiabatic flame temperature

3. With the help of combined velocity triangle for moving blades, derive the equation for power produced by an impulse engine.

4. What are the various sources of air leakage into a steam condenser? How does it affect the performance of the condensing plant?
5. Steam with absolute velocity of 300 m/s is supplied through a nozzle to a single stage impulse turbine. The nozzle angle is  $25^\circ$ , the dia of rotor is 1 m and has speed 2000 r. p. m. Find blade angles for zero axial thrust. If the blade velocity coefficient is 0.9 and steam flow rate is 10 Kg/s, calculate power.
6. In a surface condenser, the vacuum maintains is 700 mm of Hg. The barometer reads 754 mm. if the temperature of condensate is  $18^\circ\text{C}$ , determine
  - a) Mass of air presence/Kg of steam
  - b) Vacuum efficiency Given  $R=287 \text{ J/Kg K}$

### SECTION C

7. Explain with neat sketch the construction and working of Lancashire boiler.
8. During trial of single impulse turbine the following data were recorded:  
Velocity of steam is 1000 m/s, nozzle angle is  $20^\circ$ , mean blade speed 400 m/s, blade are symmetrical mass flow rate 0.75 Kg/s, neglect friction.  
Determine
  - a) Blade angle
  - b) Tangential force on the blades
  - c) Axial thrust
9. Define discharge. Derive the condition for maximum discharge through a nozzle. Also derive the equation for maximum discharge.