Roll No. ☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 09

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. Define condenser efficiency.

    b. Explain the difference between Impulse & Reaction turbines.

    c. What do you mean by pressure compounding of steam turbine?

    d. What is a pure substance? Name any five.

    e. What is the function of condenser in power plant?

    f. What is Degree of Reaction? Explain.

    g. Show T-S diagram for formation of superheated steam.

    h. Why surplus air is delivered for the combustion?

    i. What is the effect of friction on nozzles?

    j. Write a short note on the saturation temperature and the saturation pressure.

SECTION-B

2. Determine throat area, exit area and exit velocity for a steam nozzle to pass 0.2 kg/s when the inlet conditions are 12 bars and 250°C and the final pressure is 2 bars. Expansion is isentropic and inlet velocity is negligible. Take n = 1.3 for superheated steam.

3. Explain the reasons for shifting to multistage compression for reciprocating compressors, and its advantages.

4. A single stage, double acting air compressor is required to deliver 15 m^3 of air per minute measured at 1.013 bar and 20°C. The delivery pressure is 10 bar and speed 300 rev/min. Take the clearance volume as 5% of swept volume with a compression and re- expansion index n = 1.3. Calculate the swept volume of the cylinder, the delivery temperature and indicator power.

5. With the help of a neat sketch, explain a simple vapour absorption cycle.

6. Calculate mass flow rate of steam in a nozzle having inlet pressure = 10 bar, inlet temperature = 200°C, exit pressure = 0.5 bar and throat diameter = 12 mm.

SECTION-C

7. Steam is supplied to a turbine at 30 bar and 350°C. The turbine exhaust pressure is 0.08 bar. The main condensate is heated regenerative in two stages by steam bled from turbine at 5 bar and 1 bar respectively. Calculate the mass of the steam bled off at each pressure per kg of steam entering the turbine and the theoretical thermal efficiency of the cycle.

8. What are the different methods of governing a steam turbine? Explain any two with the help of neat sketches.

9. Determine the mass flow rate of steam through a nozzle having isentropic flow through it. Steam enters nozzle at 10 bar, 500°C and leaves at 6 bar. Cross-section area at exit of nozzle is 20 cm^2. Velocity of steam entering nozzle may be considered negligible. Show the process on H-S diagram also.