

Roll No.

2311

Total No. of Questions : 09]

[Total No. of Pages : 02

B.Tech. (Sem. - 3rd)
APPLIED THERMODYNAMICS - I
SUBJECT CODE : ME - 209
Paper ID : [A0805]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Classify air compressor & enlist its applications in industry.
- b) Define heat rejection ratio.
- c) Define superheated steam. Discuss the advantages of the same.
- d) What is meant by saturation temperature and saturation pressure?
- e) Differentiate the features of a water tube and a fire tube boiler.
- f) What is the function of super heater in a boiler?
- g) Explain clearly the equivalent evaporation from and at 100°C.
- h) What do you mean by the stage efficiency and overall efficiency of impulse turbine?
- i) What are the functions of the condenser in a steam plant?
- j) Discuss briefly the factors affecting the condenser capacity.

Section - B

(4 × 5 = 20)

- Q2) A fuel has the following percentage composition by mass: CO₂ 13.3%, CO 0.95%, O₂ 8.35% and N₂ 77.4%. Convert this into volumetric analysis.
- Q3) Give the constructional and working detail of Lancashire boiler with the help of suitable sketch.
- Q4) Give the chemical reactions and numeric values for estimating the air requirement for complete combustion of coal.
- Q5) Define discharge. Derive the condition for maximum discharge through a nozzle. Also derive the equation for maximum discharge.
- Q6) With the help of combined velocity triangle for moving blades, derive the equation for power produced by an impulse turbine.

Section - C

(2 × 10 = 20)

- Q7) (a) Steam enters an engine at a pressure of 12 bar with a 70°C of superheat. It is exhausted at a pressure of 0.15 bar and 0.92 dry. Find the drop in enthalpy of the steam if h_f and h_{fg} at 12 bar are 798.4 kJ/kg and 1984.3 kJ/kg. The values of h_f and h_{fg} at 0.15 bar are 226 kJ/kg and 2373.2 kJ/kg, respectively.
- (b) Define isentropic process. Derive the equations for change in internal energy, heat absorbed and work done during the isentropic process.
- Q8) (a) Discuss the various processes of Rankine cycle. Derive the equation of work done and efficiency of the cycle.
- (b) What do you understand by the term 'height of blades' as applied to a reaction turbine?
- Q9) (a) What are the methods of governing a steam turbine? Describe any one method of governing steam turbines.
- (b) Derive the equation for work per kg of air compressed by reciprocating air compressor with and without clearance.

