

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Mechanical Engineering) (Sem.-4)

APPLIED THERMODYNAMICS

Subject Code : BTME401-18

M.Code : 77546

Date of Examination : 07-05-2024

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) State how are the air compressors are classified?
- b) Define static enthalpy and total enthalpy.
- c) Differentiate between stoichiometric and non-stoichiometric combustion.
- d) What is surging and stalling in axial flow compressors?
- e) List out merits of gas turbines over I.C. engines.
- f) Define intercooler.
- g) State the assumptions made for thermal efficiency of a gas power plant.
- h) What is degree of reaction?
- i) Write down the methods of cooling the turbine blades.
- j) Write two differences between impulse and reaction turbine.

SECTION-B

2. Explain the procedure how we convert volumetric analysis into gravimetric analysis and vice-versa.
3. State the methods for improving the thermal efficiency and specific work output of rankine cycle.
4. A single stage reciprocating air compressor takes in $7.5 \text{ m}^3/\text{min}$ of air at 1 bar and 30°C and delivers it at 5 bar. The clearance is 5 percent of the stroke. The expansion and compression are polytropic, $n=1.3$. Calculate:
 - a) the temperature of delivered air
 - b) volumetric efficiency
 - c) power of the compressor.
5. Derive an expression for flow of steam through nozzles and also the condition for maximum discharge through nozzle.
6. Explain the working of air pump and cooling tower.

SECTION-C

7. Draw P-V and T-S diagram for a single stage reciprocating compressor, with and without clearance volume. Derive the expression for the work done when compression is a) isothermal and b) isentropic.
8. Calculate the enthalpy of 1 kg of steam at a pressure of 8 bar and dryness fraction of 0.8. How much heat would be required to raise 2 kg of steam from water at 20°C .
9. **Write a short note on the following :**
 - a) Need of compounding and its types
 - b) Advantages and limitations of surface condensers over jet condensers.

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.