

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

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

APPLIED THERMODYNAMICS

Subject Code : BTME-401-18

M.Code : 77546

Date of Examination : 02-06-23

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. Difference between isentropic and adiabatic process.
- b. What is adiabatic flame temperature?
- c. What is the function of nozzle?
- d. List the various types of compressors.
- e. What is dryness fraction?
- f. How does Turbine differs from a Steam Turbine?
- g. When is multistage compression used for air?
- h. Write the classification of condensers.
- i. Define reheat factor.
- j. Define the term co-generation.

SECTION-B

2. Explain with the help of neat sketch the formation of steam at constant pressure. Also, write down the various steam properties.
3. What are the different stages of combustion in internal combustion engines?
4. A Single-stage double-acting air compressor is required to deliver 14m^3 of air per minute measured at 1.013 bar and 15°C . The delivery pressure is 7 bar and the speed 300 r.p.m. Take the clearance volume as 5% of the swept volume with the compression and expansion index of $n=1.3$.

Calculate :

- a) Swept volume of the cylinder
 - b) The delivery temperature and
 - c) Indicated power.
5. Derive an expression for flow of steam through nozzle when the steam is supersaturated (or metastable).
 6. Explain the working of combined reheat-regenerative cycle.

SECTION-C

7. A simple closed cycle gas turbine plant receives air at 1 bar and 15°C , and compresses it to 5 bar and then heats it to 800°C in the heating chamber. The hot air expands in a turbine back to 1 bar. Calculate the power developed per kg of air supplied per second. Take C_p for air is 1 KJ/Kg K.
8. Derive an expression for combined velocity diagram/triangles for reaction turbine. Calculate the force, axial thrust, power, blade efficiency, stage efficiency, relative efficiency and maximum efficiency.
9. **Write a short note on the following :**
 - a) Effect of intercooling in a multistage reciprocating compressor.
 - b) Effect of air leakage in 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.