

- (b) State the advantages of super-heated steam in a turbine.
- (c) State the similarities between work and heat.
- (d) Define sensible heat factor.
- (e) What is equation of state ?
- (f) Differentiate between point and path function.
- (g) Write Carnot's theorem and its corollaries.
- (h) Mention the ways to increase the thermal efficiency of Rankine cycle.
- (i) Define adiabatic saturation temperature.
- (j) What is bypass factor ?

Roll No. ....

Total Pages : 04

**Sep-21-00026**

**B.Tech. EXAMINATION, 2021**

Semester III (CBCS)

ENGINEERING THERMODYNAMICS (ME, AE)

ME303

*Time : 2 Hours*

*Maximum Marks : 60*

---

*The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.*

---

**Note :** Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. **9** is compulsory.

**Section A**

1. What are the reasons for irreversibility of actual process ? How can we reach near reversibility conditions ? What is its importance in engineering thermodynamics ? **15**

2. A mass of 1.5 kg of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which  $pv = \text{constant}$ . The initial density of air is  $1.16 \text{ kg/m}^3$ . Find the work done by the piston to compress the air.

15

### Section B

3. Show diagrammatically the perpetual motion machines of first second and third kind. Which is law violated by each of these machines ? 15
4. An inventor claims to have developed an engine that takes in 105 MJ at a temperature of 400 K, rejects 42 MJ at a temperature of 200 K, and delivers 15 kWh of mechanical work. Would you advise investing money to put this engine in the market ? 15

### Section C

5. Define coefficient of volume expansion, isothermal and adiabatic compressibility. What is their importance in thermodynamic relations ? 15

6. One kg of air in a closed system, initially at  $5^\circ\text{C}$  and occupying  $0.3 \text{ m}^3$  volume, undergoes a constant pressure heating process to  $100^\circ\text{C}$ . There is no work other than  $p dv$  work. Find :

- (a) The work done during the process  
(b) The heat transferred  
(c) The entropy change of the gas. 15

### Section D

7. Explain, why the Rankine cycle rather than Carnot cycle is used as a standard reference for the performance of the steam plants. 15
8. A simple gas turbine plant operating on the Brayton cycle has air inlet temperature  $27^\circ\text{C}$ , pressure ratio 9, and maximum cycle temperature  $727^\circ\text{C}$ . What will be the improvement in cycle efficiency and output if the turbine process is divided into two stages each of pressure ratio 3, with intermediate reheating to  $727^\circ\text{C}$  ? 15

### (Compulsory Question)

9. Write short notes on the following :  $1\frac{1}{2} \times 10 = 15$   
(a) Draw  $p-t$  diagram for water and label it.