

**R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT**  
(An Autonomous Institute U/s UGC Act 1956)

**B.Voc. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025**

**SUBJECT CODE: 1IC303**

**DATE: 20-12-2025**

**SUBJECT NAME: BASICS OF THERMODYNAMICS**

**TIME: 11:00 AM to 01:00 PM**

**TOTAL MARKS: 50**

**Instructions**

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Attempt all questions in the question paper.
3. The figures to the right of each question indicate full marks. Make suitable assumptions with proper justification wherever required.
4. Simple, non-programmable scientific calculators are permitted.
5. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

|            |   | Marks     | BL       | CO       |
|------------|---|-----------|----------|----------|
| <b>Q.1</b> | (a) Explain the Scope of thermodynamics.  | <b>05</b> | <b>U</b> | <b>1</b> |
|            | (b) Explain the concept of system and surrounding.  | <b>05</b> | <b>U</b> | <b>1</b> |
| <b>Q.2</b> | (a) Explain Zeroth law of thermodynamics.   | <b>05</b> | <b>U</b> | <b>2</b> |
|            | (b) Explain first law of thermodynamics.  | <b>05</b> | <b>U</b> | <b>2</b> |
| <b>OR</b>  |   |           |          |          |
| <b>Q.2</b> | (a) Explain second law of thermodynamics.   | <b>05</b> | <b>U</b> | <b>2</b> |
|            | (b) Explain third law of thermodynamics.  | <b>05</b> | <b>U</b> | <b>2</b> |
| <b>Q.3</b> | (a) Explain the PVT behavior of pure substances with the help of a typical P–V–T surface diagram.         | <b>05</b> | <b>U</b> | <b>3</b> |
|            | (b) Derive the virial equation of state and discuss the physical significance of the virial coefficients. | <b>05</b> | <b>A</b> | <b>3</b> |
| <b>OR</b>  |   |           |          |          |
| <b>Q.3</b> | (a) Explain Carnot Cycle in detail.   | <b>05</b> | <b>U</b> | <b>3</b> |
|            | (b) Derive the van der waals equation and explain the significance of the constants a and b.              | <b>05</b> | <b>A</b> | <b>3</b> |
| <b>Q.4</b> | (a) Define Sensible heat and latent heat. Give suitable examples of each.                                 | <b>05</b> | <b>R</b> | <b>4</b> |

(b) Explain standard heat of reaction. 05 U 4

**OR**

**Q.4** (a) Define heat capacity and specific heat capacity in brief. 05 R 4

(b) Explain standard heat of combustion. 05 U 4

**Q.5** (a) Explain vapor compression cycle in detail. 05 U 5

(b) Explain the working of a Carnot refrigerator with a T-S diagram 05 U 5

**OR**

**Q.5** (a) Explain liquefaction processes in detail. 05 U 5

(b) What is the Coefficient of Performance (COP) in thermodynamics?  
Explain briefly. 05 U 5

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