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**INSTITUTE OF TECHNOLOGY AND MANAGEMENT**

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

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II B.Tech I Sem Regular End Examination, February-2022

**Thermodynamics**  
**(MECHANICAL ENGINEERING)**

**Max. Marks: 70**

- Note: 1. Question paper consists: Part-A and Part-B.  
 2. In Part – A, answer all questions which carries 20 marks.  
 3. In Part – B, answer any one question from each unit.  
 Each question carries 10 marks and may have a, b as sub questions.

**PART- A**

**(10\*2 Marks = 20 Marks)**

- |       |  |    |     |     |
|-------|--|----|-----|-----|
| 1. a) | What are various types of systems?                         | 2M | C01 | BL1 |
| b)    | Define thermometric property.                              | 2M | C01 | BL1 |
| c)    | What is PMM-I?   | 2M | C02 | BL1 |
| d)    | How do apply steady flow energy equation to a nozzle.      | 2M | C02 | BL1 |
| e)    | What is a heat engine? Explain with the help of a diagram. | 2M | C03 | BL1 |
| f)    | Write the statements of second law of Thermodynamics.      | 2M | C03 | BL1 |
| g)    | Define dryness fraction of steam.                          | 2M | C04 | BL1 |
| h)    | Define Dalton's law of partial pressure.                   | 2M | C04 | BL1 |
| i)    | Draw the p-v and T-s plots of Otto cycle.                  | 2M | C05 | BL1 |
| j)    | Draw the layout of Brayton cycle.                          | 2M | C05 | BL1 |

**PART- B**

**(10\*5 Marks = 50 Marks)**

- |      |   |    |     |     |
|------|---|----|-----|-----|
| 2 a) | What is concept of thermo dynamic equilibrium? Explain.       | 5M | C01 | BL4 |
| b)   | Differentiate between microscopic and macroscopic properties. | 5M | C01 | BL2 |

**OR**

- |      |  |     |     |     |
|------|--|-----|-----|-----|
| 3    | What is ideal gas temperature scale? How was it developed?                   | 10M | C01 | BL2 |
| 4 a) | Discuss the application of thermodynamics to a closed system.                | 5M  | C02 | BL2 |
| b)   | "In an isolated system, the energy of the system remains constant". Explain. | 5M  | C02 | BL4 |

**OR**

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|---|--|-----|-----|-----|
| 5 | What are the assumptions made in steady flow energy equation derivation? Discuss the applications in detail. | 10M | C02 | BL2 |
|---|--|-----|-----|-----|

- |           |  |     |     |     |
|-----------|--|-----|-----|-----|
| 6         | a) Explain Carnot cycle with the help of p-v and T-s diagrams.   | 5M  | C03 | BL4 |
|           | b) State and prove Clausius in equality.   | 5M  | C03 | BL3 |
| <b>OR</b> |  |     |     |     |
| 7         | State and prove Equivalence of kelvin Plank and Clausius Statements.   | 10M | C03 | BL3 |
| 8         | a) How do you determine specific volume, density, entropy and specific heats of mixture of gases?  | 5M  | C04 | BL2 |
|           | b) A vessel of volume $0.04 \text{ m}^3$ contains a mixture of saturated water and saturated steam at a temperature of $250^\circ \text{ C}$ . The mass of the liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy, the internal energy. | 5M  | C04 | BL3 |
| <b>OR</b> |  |     |     |     |
| 9         | Prove the work done equation for adiabatic process.  | 10M | C04 | BL3 |
| 10        | a) Draw the Layout, p-v and T-s diagrams of Rankine cycle and derive expression for efficiency.  | 5M  | C05 | BL2 |
|           | b) Compare Otto, Diesel and dual cycle for same compression ratio and heat rejection and give your conclusions.  | 5M  | C05 | BL2 |
| <b>OR</b> |  |     |     |     |
| 11        | Derive the expression for work done, thermal efficiency, mean effective pressure of Diesel cycle.  | 10M | C05 | BL6 |