Enrolment No./Seat No_____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE- SEMESTER–III EXAMINATION – WINTER 2025**

**Subject Code:3131905 Date:15-12-2025**

**Subject Name: Engineering Thermodynamics**

**Time:10:30 AM TO 01:00 PM Total Marks:70**

**Instructions:**

3. **Attempt all questions.**
4. **Make suitable assumptions wherever necessary.**
5. **Figures to the right indicate full marks.**
6. **Simple and non-programmable scientific calculators are allowed.**

| | | | Marks |
|---|---|---|---|
| **Q.1** | **(a)** | State Zeroth law of thermodynamics. | **03** |
| | **(b)** | What is quasi-static process? Explain with neat sketch. | **04** |
| | **(c)** | Write short note on thermodynamic temperature scale. | **07** |
| **Q.2** | **(a)** | State and explain first law of thermodynamics. | **03** |
| | **(b)** | Write and explain steady flow energy equation for (i) Turbine (ii) Heat exchanger. | **04** |
| | **(c)** | Write short note on limitations of first law of thermodynamics. | **07** |
| | | **OR** | |
| | **(c)** | 10 kg of fluid per minute goes through a reversible steady flow process. The properties of fluid at the inlet are : $p_1$ = 1.5 bar, $\rho_1$ = 26 kg/m3, $C_1$ = 110 m/s and $u_1$ = 910 kJ/kg and at the exit are $p_2$ = 5.5 bar, $\rho_2$ = 5.5 kg/m3, $C_2$ = 190 m/s and $u_2$ = 710 kJ/kg. During the passage, the fluid rejects 55 kJ/s and rises through 55 metres. Determine : (i) The change in enthalpy ($\Delta h$) ; (ii) Work done during the process (W). | **07** |
| **Q.3** | **(a)** | Explain principle of increase of entropy. | **03** |
| | **(b)** | State and explain different causes of irreversibility. | **04** |
| | **(c)** | Write short note on entropy change for non-flow and flow processes. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | State function of feed water heater. | **03** |
| | **(b)** | Explain in brief about reheat-regenerative cycle. | **04** |
| | **(c)** | Discuss in detail about different variables affecting efficiency of Rankine cycle. | **07** |
| **Q.4** | **(a)** | What is air standard efficiency? | **03** |
| | **(b)** | Explain simple Brayton cycle with neat sketch. | **04** |
| | **(c)** | Explain simple vapour compression refrigeration (VCR) cycle on P-h and T-s diagrams. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Explain term mean effective pressure. | **03** |
| | **(b)** | Enlist different factors affecting the performance of VCR cycle. Explain any one of them in detail. | **04** |
| | **(c)** | Write short note on Bell-Coleman cycle. | **07** |
| **Q.5** | **(a)** | What is stoichiometric air fuel ratio? | **03** |
| | **(b)** | Explain adiabatic flame temperature. | **04** |
| | **(c)** | Write short note on Bomb gas calorimeter. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | What is calorific value of fuel? | **03** |
| | **(b)** | Explain in brief about reversed Carnot cycle and its limitations. | **04** |
| | **(c)** | A mixture of hydrogen ($H_2$) and oxygen ($O_2$) is to be made so that the ratio of $H_2$ to $O_2$ is 2 : 1 by volume. If the pressure and temperature are 1 bar and 25°C respectively, calculate : (i) The mass of $O_2$ required ; (ii) The volume of the container | **07** |

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