

GUJARAT TECHNOLOGICAL UNIVERSITY
BE • SEMESTER-III (NEW) • EXAMINATION – SUMMER 2015

Subject Code: 2132502**Date: 04/06/2015****Subject Name: Engineering Thermodynamics & Heat transfer****Time: 02.30pm-05.00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define the following terms: **07**
 (i) System (ii) Property (iii) State (iv) Process (v) Boundary (vi) Cycle (vii) Pure Substance
- (b) What do you mean by Thermodynamic equilibrium? Explain its types. **07**
- Q.2** (a) A cyclic heat engine operates between a source temperature of 1000°C and a sink temperature of 40°C . Find the least rate of heat rejection per kW net output of the engine? **07**
- (b) Establish the inequality of Clausius. **07**
- OR**
- (b) What do you understand by the dead state? What is meant by availability? **07**
- Q.3** (a) Derive the general heat conduction equation for Cartesian coordinate system. **07**
- (b) Derive an expression for heat transfer for an adequately long of Rectangular fin with insulated tip. **07**
- OR**
- Q.3** (a) Explain the process of steam formation using p-v and h-s diagram. **07**
- (b) By dimensional analysis show that for forced convection heat transfer the Nusselt number can be expressed as a function of Prandtl number and Reynolds number. **07**
- Q.4** (a) Derive equation of logarithmic mean temperature difference for parallel flow Heat-exchanger. **07**
- (b) Explain term Boiling also explain various regimes of boiling. **07**
- OR**
- Q.4** (a) Explain with neat sketch Boundary Layer concept and show velocity boundary layer growth due to flow over plate **07**
- (b) Water flows at the rate of 70 kg/min, through a double pipe counter flow heat exchanger. Water is heated from 50°C to 80°C by an oil following through the tube. The oil enters at 115°C and leaves at 75°C . The overall heat transfer coefficient $350 \text{ W/m}^2\text{K}$. Take specific heat of the oil is 1.884 kJ/kg K . **07**
- Q.5** (a) Explain emissivity and absorptivity of a surface. Also differentiate between black body and grey body. **07**
- (b) Define shape factor. State silent features of shape factor. **07**
- OR**
- Q.5** (a) Explain the following laws of Radiation (i) Planck's law (ii) Wein's displacement law. **07**
- (b) Define condensation process also explain film condensation and drop-wise condensation. **07**
