Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 140503 **Date: 08/06/2017**

Subject Name: Process Heat Transfer

Time: 10:30 AM to 01:00 PM **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)** Derive equation for heat tyransfer through a composite wallmade up of 3 different materials in close thermal contact with each other with no heat loss to surrounding when temperatures of hot and cold encs are T_a and T_b. **07**

(b) Water flowing at rate 0.15 Kg/sec is heated from 40^0C to 80^0C in a counter current double pipe heat exchanger. The hot fluid is oil and enters exchanger at 105^0C and leaves at 70^0C. Calculate heat transfer area if overall heat transfer coefficient is 300 w/m^2 ^{0}C. Sp heat of water is 4.186 kj/kg ^{0}k. **07**

Q.2 **(a)** With a neat diagram show the 1-2 Shell and Tube Heat exchanger with various parts. **07**

(b) Discuss various types of fins used in Shell and Tube heat exchanger. **07**

OR

(b) Discuss unsteady state heat transfer in a long flat plate. **07**

Q.3 **(a)** Discuss Pool boiling. Explain various regimes of Pool boiling. What is Critical flux? How knowledge of critical is useful? **07**

(b) Discuss heat transfer in an agitated vessel. Derive equation for rate of heat transfer in an agitated vessel. **07**

OR

Q.3 **(a)** State and explain Kirchoff's law of radiation. Explain what is black body and what is Grey Body. **07**

(b) Two large parallel plates with temp 400 C & 900 C & emissivity 0.4 and 0.75 are engaged in radiative heat transfer .Calculate the rate of heat transfer. **07**

Q.4 **(a)** With neat diagram show construction and working of any one Evaporator. **07**

(b) Discuss various types of Feed arrangement used in multiple effect evaporators with its merits and demerits. **07**

OR

Q.4 **(a)** Discuss capacity and Economy of Evaporator with reference to single and multiple effect evaporator. **07**

(b) An Evaporator is to be fed with 5000 kg/hr of 10 % sugar solution by weight. The feed enters at 40 C and is to be concentrated to 40 % by weight of solute under an absolute pressure of 1.03 kg/cm^2. Steam is available at an absolute pressure of 3 atm (Saturation temp. of 134 C). The overall heat transfer coefficient is 1750 w/m^{2}C. Calculate heat transfer area and steam required. **07**

Q.5 **(a)** Discuss various types of Baffles used in Shell and Tube Heat exchanger. **07**

(b) Discuss LMTD correction factor. **07**

OR

Q.5 **(a)** Discuss construction and working of Plate type Heat exchanger. **07**

(b) Discuss Natural convection**.** **07**

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