

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**DIPLOMA ENGINEERING – SEMESTER –IV • EXAMINATION – SUMMER- 2017**

**Subject Code: 3340501****Date: 27-04- 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.
4. Use of programmable & Communication aids are strictly prohibited.
5. Use of only simple calculator is permitted in Mathematics.
6. English version is authentic.

- Q.1** Answer any seven out of ten. **14**
1. Define evaporator capacity and economy
  2. Define emissivity and absorptivity.
  3. Define black body and opaque body
  4. Give mathematical expression of Fourier's law.
  5. Define conduction and radiation.
  6. State Duhring's rule.
  7. What are disadvantages of double pipe heat exchanger?
  8. Define latent heat.
  9. List different methods of feeding multiple effect evaporators.
  10. Give typical temperature profile of a counter flow heat exchanger.
- Q.2** (a) Differentiate steady state and unsteady state heat transfer. **03**
- OR
- (a) Explain importance of heat transfer in process industries. **03**
- (b) Define : Heat, Rate of heat transfer and Temperature gradient **03**
- OR
- (b) Write a short note on thermal conductivity. **03**
- (c) Derive equation of steady state heat transfer through composite wall for two layers. **04**
- OR
- (c) Derive equation of steady state heat transfer through a cylinder. **04**
- (d) Explain optimum thickness of insulation. **04**
- OR
- (d) A furnace wall made up of Sil-o-cel brick 114 mm thick and common brick 229 mm thick. The inner temperature is 760 °C and outer temperature is 80 °C. Find the heat loss per unit area of wall if the thermal conductivity for Sil-o-cel brick and common brick in W/(m. °C) are 0.138 and 1.38 respectively. **04**
- Q.3** (a) Explain Newton's law. **03**
- OR
- (a) Classify heat exchanger based on flow pattern. **03**
- (b) Give function of following parts in shell and tube heat exchanger: **03**
- 1) baffle    2) tie rod    3) tube sheet
- OR
- (b) Write a short note on Types of baffles. **03**
- (c) Describe free convection and force convection. **04**

- OR
- (c) Explain double pipe heat exchanger with neat sketch. **04**  
 (d) Give only figure of 1-2 shell and tube heat exchanger. **04**
- OR
- (d) Write a short note on finned type heat exchanger. **04**
- Q.4** (a) Explain Stefan Boltzmann law. **03**
- OR
- (a) Explain fundamental facts of radiation. **03**  
 (b) Give difference between drop wise and film wise condensation. **04**
- OR
- (b) Give significance of Prandtl No. and Nusselt No. **04**  
 (c) Derive an equation for LMTD. **07**
- Q.5** (a) Give difference between single and multi effect evaporation. **04**  
 (b) Write a short note on falling film evaporator. **04**  
 (c) Classify evaporators. **03**  
 (d) A body at 32 °C is placed in a large furnace whose wall temperature is 1500 K. If absorptivity of body is 0.5, calculate amount of heat absorbed per unit area. Value of Stefan Boltzmann constant is  $408 \times 10^{-8} \text{ kcal/hr.m}^2.\text{K}^{-4}$ . **03**

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