

**GUJARAT TECHNOLOGICAL UNIVERSITY****DIPLOMA ENGINEERING – SEMESTER – 4(NEW) • EXAMINATION – SUMMER 2018****Subject Code: 3340501****Date: 03-May-2018****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: Insulation.
  2. Define: Temperature gradient.
  3. State Fourier's law.
  4. Define: Conduction and Heat flux.
  5. State Newton's law of cooling.
  6. List out types of Baffles.
  7. Give function of tie rod and spacer in shell and tube heat exchanger.
  8. Give definition and significance of Prandtl number.
  9. Define: Radiation and Emissivity.
  10. What is the advantage of using multi effect evaporator over single effect evaporator?
- Q.2** (a) Differentiate between steady state and unsteady state heat transfer. **03**  
OR
- (a) Discuss Thermal conductivity and its variation with temperature. **03**  
(b) Explain optimum thickness of insulation. **03**  
OR
- (b) Derive steady state heat conduction through 1-D wall. **03**  
(c) Derive equation for critical radius of insulation. **04**  
OR
- (c) A wall is made of brick of thermal conductivity 1.0 W/(m.K), 230 mm thick. It is lined on the inner face with plaster of thermal conductivity 0.4 W/(m.K) and thickness 10 mm. If a temperature difference of 30 K is maintained between the two faces, calculate the heat flow per unit area of wall. **04**  
(d) Discuss types of condensation with example. **04**  
OR
- (d) Differentiate between dropwise condensation and film wise condensation. **04**
- Q.3** (a) Give difference between cooler, condenser and chiller. **03**  
OR
- (a) Give major disadvantages of double pipe heat exchanger. **03**  
(b) In a double pipe heat exchanger, hot fluid has temperatures of 140 °C and 85 °C. Cold fluid has temperatures of 30 °C and 60 °C. Calculate LMTD for counter flow. **03**  
OR
- (b) Classify heat exchangers based on flow pattern and construction. **03**  
(c) Draw a neat sketch of 1-2 shell and tube heat exchanger. **04**

- OR
- (c) Write a short note on plate type heat exchanger. **04**
- (d) Explain regimes of pool boiling. **04**
- OR
- (d) Give definition and significance of Reynold number and Grashoff Number. **04**
- Q.4** (a) Describe Duhring's rule and its importance. **03**
- OR
- (a) Compare forward feed and backward feed arrangement for multiple effect evaporator. **03**
- (b) State and explain Kirchhoff's law. **04**
- OR
- (b) Discuss concept of black body. **04**
- (c) Derive equation of LMTD for parallel flow. **07**
- Q.5** (a) Explain characteristics of liquid for evaporation. **04**
- (b) Explain long tube vertical evaporator. **04**
- © Calculate the rate of heat transfer by radiation from an unlagged steam pipe, 50 mm OD at 393K to air at 293 K. Take value of emissivity as 0.90. **03**
- (d) Explain Weins displacement law. **03**

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