Seat No.: _____                                    Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY
## DIPLOMA ENGINEERING – SEMESTER – IV • EXAMINATION – SUMMER- 2016

**Subject Code: 3340501**                              **Date:  09- 05- 2016**
**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.**

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|---|---|---|---|
| **Q.1** | | Answer any seven out of ten. | **14** |
| | 1. | Define: Emissivity | |
| | 2. | Define: Condensation | |
| | 3. | Define: Heat transfer rate | |
| | 4. | Define: Composite structures | |
| | 5. | Define: Specific heat | |
| | 6. | Define: Pitch | |
| | 7. | Give function of tube sheet in shell and tube heat exchanger | |
| | 8. | Give function of baffles in shell and tube heat exchanger | |
| | 9. | Give function of tie rod in shell and tube heat exchanger | |
| | 10. | What are heat sensitive materials? | |
| **Q.2** | (a) | Differentiate between steady state and unsteady state heat transfer. | **03** |
| | | OR | |
| | (a) | Classify modes of heat transfer. | **03** |
| | (b) | Define heat flux and temperature gradient. | **03** |
| | | OR | |
| | (b) | Draw only a neat figure showing regimes of pool boiling. | **03** |
| | (c) | Discuss variation of thermal conductivity with temperature in solids, liquids and gases. | **04** |
| | | OR | |
| | (c) | Derive Fourier's law. | **04** |
| | (d) | State and explain Kirchoff's law. | **04** |
| | | OR | |
| | (d) | Give any four dimensionless groups in heat transfer with their significance. | **04** |
| **Q.3** | (a) | Explain Newton's law of convective heat transfer. | **03** |
| | | OR | |
| | (a) | Calculate heat loss per $m^2$ of surface through a brick wall 0.5 m thick when the inner surface is at 400K and outside surface is at 310K. The value of thermal conductivity is 0.7 W/(m.K) | **03** |
| | (b) | Calculate the heat loss by radiation from an unlagged steam pipe having 50 mm o.d. at 377K to air at 283K. Value of emissivity may be taken as 0.90. | **03** |
| | | OR | |
| | (b) | What is nucleate boiling? | **03** |
| | (c) | Differentiate between types of convection. | **04** |
| | | OR | |
| | (c) | Explain various types of baffles. | **04** |

|       | (d) | Give classification of heat exchangers based on flow pattern. | **04** |
|-------|-----|--------------------------------------------------------------|--------|
|       |     | OR                                                           |        |
|       | (d) | Draw neat figure of 1-1 shell and tube heat exchanger.       | **04** |
| **Q.4** | (a) | Explain Steafan Boltzmann law.                             | **03** |
|       |     | OR                                                           |        |
|       | (a) | Give classification of evaporators.                          | **03** |
|       | (b) | Explain Duhring's rule and its importance.                   | **04** |
|       |     | OR                                                           |        |
|       | (b) | In a double pipe heat exchanger hot fluid has temperatures of 145 and 90 $^{o}$C and cold fluid has temperatures of 35 and 65 $^{o}$C. Calculate LMTD for counter flow. | **04** |
|       | © | Derive expression for overall heat transfer coefficient using individual heat transfer coefficients. | **07** |
| **Q.5** | (a) | Discuss any three characteristics affecting evaporation.   | **04** |
|       | (b) | Differentiate between single effect and multiple effect evaporators. | **04** |
|       | © | What are the uses of insulation?                             | **03** |
|       | (d) | Define black body, gray body and white body.                 | **03** |

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