



Reg. No. : .....

Name : .....

**Sixth Semester B.Tech. Degree Examination, June 2018.**  
**(2008 Scheme)**  
**08.604 – HEAT AND MASS TRANSFER (MU)**

Time : 3 Hours

Max. Marks : 100

**Instruction :** Answer all questions from Part – A. HMT data book is **permitted**.

**PART – A**

1. Give examples for one dimensional and two dimensional heat conduction.
2. What are the types of boundary conditions used in heat transfer ?
3. What is thermal resistance ?
4. How does thermal conductivity of gas change with temperature ?
5. State the difference between hydrodynamic boundary layer and thermal boundary layer.
6. Define :
  - i) Biot number and
  - ii) Grashoff number.
7. What is a radiation shield ?
8. State Wein's displacement law.
9. How does evaporation of a liquid take place ?
10. State Fick's law of diffusion. **(4×10=40 Marks)**

**PART – B**

11. A 1m thick steel plate ( $K = 40 \text{ W/m-k}$ ) is well insulated on top and bottom surfaces. The left side is at  $100^\circ\text{C}$  and the right side is cooled by a fluid at  $30^\circ\text{C}$ . Under steady state condition with no heat generation, a thermocouple at the mid point of the plate reads  $80^\circ\text{C}$ . What is the value of the convection heat transfer coefficient at the right side of the surface ? **20**

OR

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12. Derive an expression for critical thickness of insulation for a cylinder. 20
13. Conduct a dimensional analysis to establish the functional relationship among the non dimensional numbers in forced convection. 20

OR

14. In a counter flow heat exchanger, oil ( $C_p = 2000 \text{ J/kgK}$ ) is cooled from  $130^\circ\text{C}$  to  $50^\circ\text{C}$ . The coolant water flowing at a rate of  $8 \text{ kg/s}$  is heated from  $30^\circ\text{C}$  to  $50^\circ\text{C}$ . The overall heat transfer coefficient is  $800 \text{ W/m}^2\text{K}$ . Calculate the oil flow rate and heat transfer area. 20
15. State and prove the reciprocity theorem. 20

OR

16. State and prove Wein's displacement law. 20
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