B. E. 6th Semester (Mechanical Engg.) Examination,

May–2010

HEAT AND MASS TRANSFER

Paper–ME-306-C

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt **five** questions selecting at least **two** questions from each section. Use of steam tables, charts and graphical plots are permitted.*

Section–A

1. (a) Explain different modes of heat transfer with suitable example. 10

(b) Derive and discuss fourier of heat conduction with assumptions made. 10

2. (a) Derive 3-D heat conduction equation in polar coordinates. 12

(b) Define critical thickness of insulation and derive the relation for the same. 8

3. Set up expressions for temperature distribution during steady state heat conduction in a plane wall with

uniform heat generation when (a) both surfaces are at same temperature and (b) both surfaces are at different temperature. 20

4. (a) What is meant by lumped capacity ? What are the physical dimensions necessary for a lumped unsteady state analysis to apply ? 10

(b) Derive relation for transient heat conduction in a sphere with convective boundary condition. 10

Section–B

5. (a) Derive the relation for radiant heat exchange between two gray surfaces. 10

(b) Explain the utility of radiation shields and special features of radiation from gases. 10

6. (a) Two parallel walls, each 1.25 m high, form a 7.5 cm. thick vertical slot containing air at atmospheric pressure. Make calculations for the effective thermal conductivity and heat flux if the hotter and cooler walls are at 77°C and 27°C temperatures respectively. 12

(b) Derive momentum equation for the hydrodynamic boundry layer. 8

7. (a) Derive the relationship between the effectiveness and number of transfer units for a parallel flow heat exchanger. 14

(b) Difference between AMTD and LMTD with significance. 6

8. Write short notes on :

(a) Different modes of mass transfer

(b) Nucleate and film boiling

(c) Drop wise condensation

(d) Ficks law of diffusion. 4×5=20