Roll No. ☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ME) (E-I 2011 Onwards) (Sem.–6)
HEAT EXCHANGER DESIGN
Subject Code : DE/ME-1.7
Paper ID : [A2408]

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1.   **Write short notes on :**

a) What are applications of heat exchangers?

b) What is overall heat transfer coefficient? Write the expression for overall heat transfer for a tubular heat exchanger (HX) based on inner surface.

c) Draw temperature profile for parallel and counter flow type heat exchangers.

d) What are the selection criteria for the heat exchangers?

e) What is boiling? Write its types.

f) A short note on multiple effect evaporators.

g) What is the significance of L M T D?

h) Draw the schematic diagram for Heat Pipe.

i) What is fouling factor? What is its role in the heat transfer process?

j) What are the compact heat exchangers and their area of application?

SECTION-B

2. A copper pipe (k = 350W/m K) of 1.75 cm inner diameter and 2.0 cm outside diameter conveys water and the oil flows through the annular passage between this pipe and a steel pipe. On the water side, the film coefficient is $4600W/m^2$ K and the fouling factor is $0.00034m^2$ K/W. the corresponding values for the oil side are $1200W/m^2$ K and 0.00086 m^2 K /W. work out the overall heat transfer coefficient between the water and oil.

3. Distinguish between mechanism of film wise condensation and drop wise condensation.

4. Discuss types of fouling and their effect on the performance of heat exchangers. What are the cleaning methods used to remove fouling?

5. With the help of neat sketch of boiling curve, discuss in detail various regimes in boiling.

6. Explain the operation and maintenance of heat pipe heat exchanger.

SECTION-C

7. Exhaust gases (c_p=1.12KJ/Kg-deg) flowing through a tubular heat exchanger at the rate of 1200Kg/hr are cooled from 400°C to 120°C. the cooling is affected by water (c_p=4.18KJ/Kg K)that enters the system at 10°C at the rate of 1500Kg/hr. if the overall heat transfer coefficient is 500KJ/m^2-hr-deg, what heat exchanger area is required to handle the load for (A) parallel flow and (B) counter flow arrangement?

8. Derive an expression for the logarithmic mean temperature difference (LMTD) for counter flow.

9. Explain the plate heat exchanger and plate fine heat exchanger.