

Roll No

MMTP-202

M.E./M.Tech. II Semester

Examination, December 2016

Design of Heat Exchangers

Time : Three Hours

Maximum Marks :70

Note : Attempt any five questions. All questions carry equal marks.
Use of Heat and Mass transfer data book is permitted.

1. a) What are the requirements of heat exchanger? Draw and label a hairpin heat exchanger.
b) Explain selection criteria of a heat exchanger on the basis of major operating parameters.
2. a) What is compact heat exchanger? Enlist their characteristic as compared to conventional shell-and-tube exchangers.
b) What do you understand by micro heat exchangers? What are its advantages over macroscale heat exchangers?
3. In an industry, 0.6 kg/s of oil ($c_p = 2.5 \text{ kJ/kgK}$) is to be cooled in a counter flow heat exchanger from 110°C to 35°C by the use of water entering at 20°C . The overall heat transfer coefficient is expected to be $1500 \text{ W/m}^2\text{K}$. Presume that the exit temperature of water is not to exceed 80°C . Using NTU method, calculate :
 - i) The water flow rate
 - ii) The surface area required and
 - iii) The effectiveness of the heat exchanger

4. a) List the assumptions in the derivation of the relation for LMTD. Mathematically prove that LMTD is usually less than the Arithmetic Mean Temperature Difference (AMTD).
b) What are the standard testing methods for heat exchangers? Discuss the eddy current testing of heat exchangers.
5. a) Explain various fouling mechanism that may occur on the liquid side of a heat exchanger.
b) Explain the operation of heat pipe. Why it is called superconductor? What are the advantages of heat pipe?
6. a) What are the different types of shells recommended by TEMA? Explain them briefly.
b) What are the different types of tubes used in shell and tube heat exchangers? Explain each of them briefly.
7. a) How is the allocation of fluid to shell side and tube side decided?
b) What are the unresolved problems in the heat exchanger design?
8. Write short notes on any two of the following:
 - a) Air washer
 - b) Evaporative condensers
 - c) Corrosion in heat exchanger
 - d) Advantages of using software in heat exchanger design
