

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2018

M. Tech. in Thermal Engineering, Semester: II

Roll No.....

TEMTech223: Design of Heat Exchange Equipment

Time: 3 hours

Max. Marks: 80

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. The heat transfer co-efficient in film type condensation is _____ that for dropwise condensation
(a) Lower than (b) Greater than (c) Same as (d) half
- ii. Which of the following is not associated with heat exchanger?
(a) Fouling (b) NTU (c) Capacity ratio (d) Mc Adam's correction factor
- iii. The engine oil at 150°C is cooled to 80°C in a parallel flow heat exchanger by water entering at 25°C and leaving at 60°C. Estimate the exchanger effectiveness
(a) 0.56 (b) 0.66 (c) 0.76 (d) 0.86
- iv. Which of the following phases of designing of heat exchangers does designer consider corrosive nature of the fluid in?
(a) The thermal analysis (b) The mechanical design
(c) The design for manufacture (d) none of the above
- v. Which of the following is NOT a type of heat exchanger?
(a) Recuperator (b) Regenerator (c) Mixer (d) none of the above
- vi. Which of the following is/are example of direct contact type heat exchanger?
(a) jet condenser (b) de-super heater (c) cooling tower (d) all of the above
- vii. Large sized and heavy shell & tube heat exchangers are suitable for
(a) automotive applications (b) aircraft applications
(c) marine applications (d) none of the above
- viii. The flow arrangement of two fluids in compact heat exchangers is
(a) Parallel flow (b) Counter flow (c) cross flow (d) none of the above
- ix. Which of the following represents the effective surface area of finned tube surface?
(a) $A = A_{\text{unfinned}} + A_{\text{fin}}$ (b) $A = \eta_{\text{fin}} (A_{\text{unfinned}} + A_{\text{fin}})$
(c) $A = A_{\text{unfinned}} + (\eta_{\text{fin}} \times A_{\text{fin}})$ (d) $A = (\eta_{\text{fin}} \times A_{\text{fin}})$
- x. For the same heat transfer Q and same overall heat transfer coefficient U_o , surface area required for parallel flow operation is always
(a) smaller than LMTD for counter flow (b) greater than LMTD for counter flow
(c) same as LMTD for counter flow (d) unpredictable

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 4×2.5
- Differentiate between regenerative and recuperative heat exchanger?
 - What is the purpose of using baffles in a heat exchanger?
 - What do you mean by mixed and unmixed flow as applied to cross flow heat exchanger?
 - What do you mean by correction factor for a cross flow heat exchanger?
- Q.3A Discuss the effect of temperature in condenser and evaporator in detail. 05
- Q.3B Explain construction and working of shell and tube heat exchanger. 05
- Q.4A Write short notes on "Performance degradation of heat exchanger subjected to fouling". 05
- Q.4B Explain construction and working of finned surface heat exchanger. 05
- Q.5A Discuss the commonly used evaporators in details which are commonly used for refrigeration and air conditioning. 05
- Q.5B Cold water enters a counter flow heat exchanger at 10° C at a rate of 8 kg/s, where it is heated by a hot water stream that enters the heat exchanger at 70° C at a rate of 2 kg/s. Cp of water is 4.18 kJ/kg-K. Determine the maximum heat transfer rate and the outlet temperatures of the cold and the hot water streams for this limiting case. 05
- Q.6A Differentiate between air-cooled and water-cooled condensers with help of suitable example. 05
- Q.6B What is pinch point of Heat Exchanger? Discuss the effect of pinch point with help of suitable example. 05
- OR
- Q.6 Discuss the various techniques in details which are being used for heat transfer enhancement. 10
- Q.7 Discuss the function and design consideration of condensers in details with the help of Temperature (T) – Entropy (S) plot. 10
- Q.8 Discuss the following condensers in detail with the help of suitable example. 05+05
- (a) Plate Condenser (b) Direct contact condensers