

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2181924

Date: 06/05/2017

Subject Name: Design of Heat Exchanger(Department Elective III)

Time: 10:30 AM to 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss recuperative and regenerative type of Heat Exchangers along with their specific applications **07**
- (b)** Explain the factors to be considered while selecting heat exchangers? **07**
- Q.2 (a)** Compare the LMTD and ϵ -NTU approach for analysis and design of heat exchangers. **07**
- (b)** Explain the design of double pipe heat exchangers. **07**
- OR**
- (b)** Draw the temperature profile of a heat exchanger for the following condition. **07**
(1) parallel flow (2) counter flow (3) $Ch \rightarrow \infty$ (4) $Cc \rightarrow \infty$
- Q.3 (a)** Discuss various shell types suggested by TEMA standard for shell and tube heat exchangers. **07**
- (b)** Derive expression for hydraulic diameter and equivalent diameter in case of double pipe heat exchanger with and without fin with neat sketch. **07**
- OR**
- Q.3 (a)** A counter flow shell and tube heat exchanger is used to cool engine oil flowing through the tube at 0.25 kg/s. The specific heat of is 2.2kJ/kg-k. This oil is cooled by the water, which flows at 0.3 kg/s. The oil enters at 560 K and leaves at 340 K. The cooling water enters at 298 k. find the length of the tube if the heat transfer coefficient from oil to tube surface is 2340 W/m² -K, and from the tube to water is 6215 W/m² -K. The mean diameter of the tube is 18 mm. **07**
- (b)** Explain the advantages and disadvantages of double pipe heat exchangers. **07**
- Q.4 (a)** Explain giving precious reason why fouling fluids are not used in compact heat exchangers **07**
- (b)** What is fouling? Explain types and mechanisms of fouling. **07**
- OR**
- Q.4 (a)** Explain different techniques for heat transfer enhancement in heat exchanger. **07**
- (b)** Describe in Brief Performance evaluation of Heat Transfer Enhancement technique. **07**
- Q.5 (a)** Air at 1 atm and 400 K and with a velocity of $u_{\infty} = 10$ m/s flows across a compact heat exchanger matrix having $\sigma = (A_{min}/A_{fr}) = 0.534$ and Hydraulic diameter (D_h) = 0.3633 cm. Calculate the heat transfer coefficient, h and frictional pressure drop for air side. The length of matrix is 0.6 m. Use following properties $\rho = 0.8825$ kg/m³, $\mu = 2.29 \times 10^{-5}$ Kg/ms, $C_p = 1013$ J/kgK, $Pr = 0.719$. Use Figure. 1 for extra data. **07**
- (b)** State and explain the basic advantages and limitations of compact heat exchangers. **07**
- OR**
- Q.5 (a)** Discuss Bell-Delaware method to determine shell-side heat transfer coefficient **07**

(b) Shell and tube type heat exchangers are the most common type of heat exchangers .Why? State its different applications in industries. 07

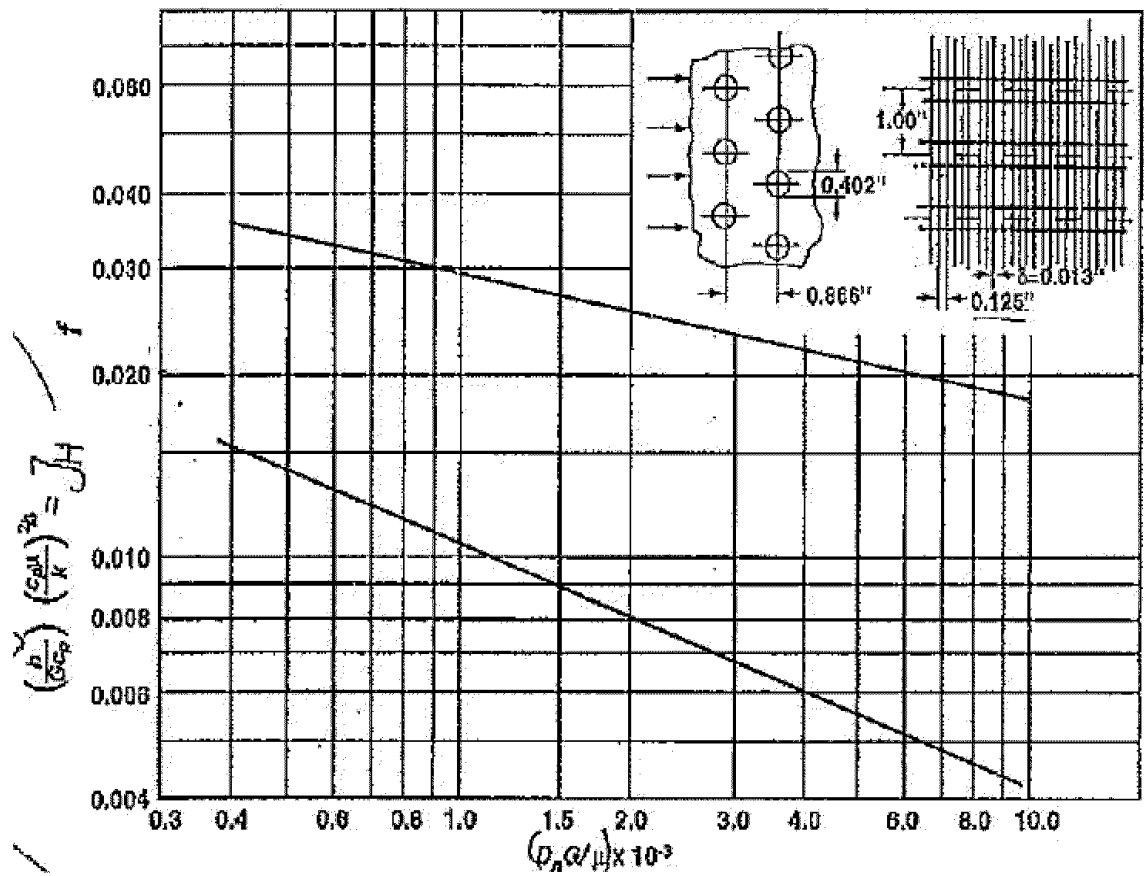


Figure: 1
