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. (1) parallel flow (2) counter flow (3) Ch →∞ (4) Cc →∞	**07**
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/m^2 -K, and from the tube to water is 6215 W/m^2 -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∞= 10 m/s flows across a compact heat exchanger matrix having σ= (Amin/Afr) = 0.534 and Hydraulic diameter (Dh) = 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 ρ = 0.8825 kg/m3, μ = 2.29 × 10-5 Kg/ms, Cp = 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**

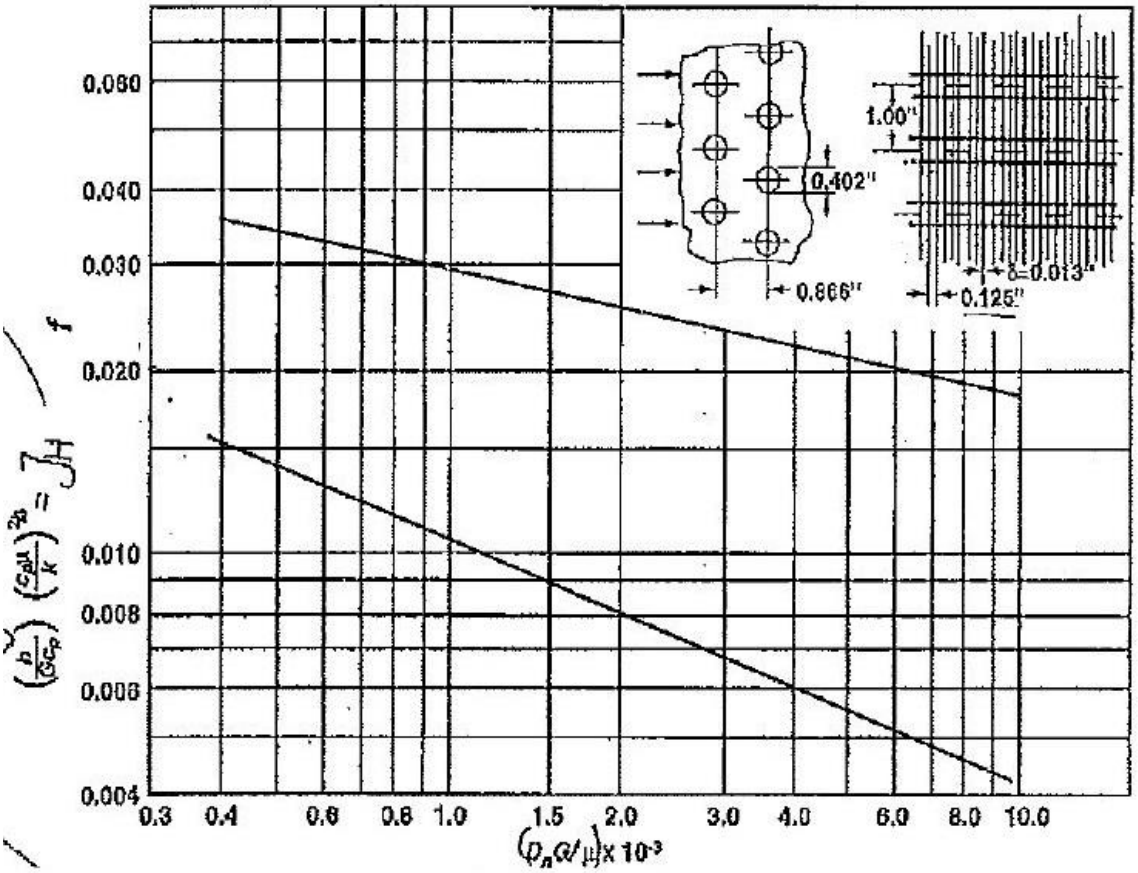

Figure: 1

****