GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

SM19002047

Registration No: | | | | | | | | | | |

Total Number of Pages :2 **M.TECH**

M.TECH 2ND SEMESTER (AR 17) SUPPLEMENTARY EXAMINATIONS, APRIL/MAY 2019

HEAT EXCHANGER ANALYSIS AND DESIGN

Branch: TE, Subject Code:MTEPE2032

Time: 3 Hours **Max Marks : 70**

PART-A **(10 X 2=20 MARKS)**

1. Answer the following questions.

a) What is limitation of the LMTD method? How ε-NTU method is superior to correction factor-LMTD method?

b) What are the factors affecting cooling tower performance.

c) What do you mean by hydraulic diameter and its effect on design of heat exchanger?

d) Differentiate between direct contact type and storage type heat exchanger.

e) When a heat exchanger is called as compact heat exchanger? Give an example.

f) What are the causes of pressure drop in shell and tube heat exchangers?

g) In a cross flow both fluids unmixed has water at 6^0C flowing at 1.25 kg/s. It is to cool 1.2 kg/s of air that is initially at temperature of 50^0C.Calculate NTU & heat capacity ratio. Assume U=130W/m^2K and area is 23m^2.

h) The extended surfaces are always used on gas side in liquid to gas heat exchange, justify your answer.

i) What is correction factor, where it is used?

j) Explain briefly Bell –Delaware method with neat sketch and its importance.

PART-B **(5 X 10=50 MARKS)**

Answer any five questions from the following.

2. a) What are the common causes of fouling in a heat exchanger? How does fouling affects heat transfer and pressure drop? [5]

b) How the TEMA charts are useful in design of a multiple pass heat exchanger? [5]

3. a) Classify heat exchanger according to flow and constriction type, Explain different characteristics. [6]

b) Describe different types of baffles and its purpose of use. [4]

4. a) What are the various sources of a noise in a heat exchanger? How it can be minimized in heat exchanger? [5]

b) Steam enters a counter flow heat exchanger, dry saturated at 10 bar and leaves at 350^0C. The mass flow of stream is 800 kg/min. The gases enter the heat exchanger at 650^0C and mass flow rate is 1350 kg/min. If the tubes are 300 mm diameter and 3 m long, determine the number of tubes required. Neglect the resistance offered by metallic tubes. [5]

5. a) A water–water gasketed plate heat exchanger has an overall heat transfer coefficient under fouled conditions of 4200 W/m2.K. Hot- and cold-fluid-side heat transfer coefficients are 15,000 and 14,000W/m^2 .K, respectively. The plate thickness (stainless steel 316) is 0.6 mm, and the thermal conductivity is 17W/mK. Calculate the total fouling resistance for this heat exchanger. [5]

b) Briefly explain about Flow pattern of baffles. [5]

6) a) Derive the effectiveness of parallel flow heat exchanger. What would be the effectiveness of counter [5]

flow heat exchanger if Cmin/Cmax =0 and Cmin/Cmax=1?

b) Explain how charts provided by Kays and London are useful in the design of heat exchangers? [5]

7) a)Hot oil is to be cooled by water in a 1-shell-pass and 8-tube-passes heat exchanger. The tubes are thin-walled and are made of copper with an internal diameter of 1.4 cm. The length of each tube pass in the heat exchanger is 5m, and the overall heat transfer coefficient is 310 W/m2 .°C. Water flows through the tubes at a rate of 0.2 kg/s, and the oil through the shell at a rate of 0.3 kg/s. The water and the oil enter at temperatures of 20°C and 150°C, respectively. Determine the rate of heat transfer in the heat exchanger and the outlet temperatures of the water and the oil. [6]

b) Water at 60^0C is to be cooled by the help of oil at 25^0C in a multiple pass shell and tube heat exchanger. The outlet temperatures of both the oil and water are 40^0C and 45^0C respectively. Determine the LMTD and Effectiveness of Heat exchanger if the flow is i)parallel ii) counter [4]

C(water) = 4.187 kj/kgk, C(oil)= 2.081 kj/kgk

8. Write short notes on:

a)Heat pipe [5]

b) Differential thermal Expansion and thermal stresses [5]

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