QP Code: RM23MTECH161 Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPETE2041 – Design of Heat Exchangers

(Heat Power and Thermal Engineering)

Time: 3 Hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. Analyse the causes of pressure drop in shell and tube heat exchangers?	CO1	K3
b. Explain purpose of using baffles in a heat exchanger	CO4	K2
c. Illustrate mixed and unmixed flow as applied to cross flow heat exchanger	CO3	K2
d. Justify the reasons for how can the flow induced vibration be minimised?	CO3	K4
e. Under what condition, the effectiveness NTU method is preferred over LMTD method as a method of analysis of Heat exchanger	CO3	K2
f. Explain compact heat exchanger and write the importance of Area density in it.	CO1	K2
g. Justify, how we are really getting extra advantage by providing Baffles in Shell and tube heat exchanger.	CO1	K3
h. In a liquid to gas heat exchanger, it is best to put extended surfaces on the gas side. Analyse	CO2	K3
i. Explain the type of heat exchanger recommended for recovery of heat from blast furnace?	CO4	K3
j. Indicate When can the overall heat transfer coefficient be expressed as U=(1/hi+1/ho)	CO2	K2

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions

		Marks	CO#	Blooms Level
2. a.	In a shell and tube counter flow heat exchanger, water flows through a copper tube of 20 mm ID and 23 mm OD. Oil passes through the shell. Water enters at 20 ^oC and leaves at 30 ^oC. Oil enters at 75 ^oC and leaves at 60^oC. Water and oil have the coefficients of 4500 and 1250 W/m^2 K respectively. Thermal conductivity of the tube wall is 355 W/ m-K. The fouling factor for water and oil are 0.0004 and 0.0001 respectively. If the length of the tube is 2.4 m, Calculate overall Heat transfer coefficient.	10	CO1	K3
3.a.	Classify heat exchangers according to flow type and construction type. Explain characteristics of each type of heat exchangers. Analyse when is a heat exchanger classified as being compact? Cite examples.	10	CO2	K4
4. a.	Hot Gases are used in a finned tube heat exchanger to heat 2.5 kg/S of water (c = 4.18 kJ / kg ^oC) from 35^oC to 85 ^oC. The gases (c = 1.09 kJ / kg ^oC) enter as 200 ^oC and leaves at 93 ^oC. Overall heat transfer coefficient is 180 W/m^{2o}C. Evaluate the area of the Heat Exchanger and the effectiveness. Take NTU = 1.4.	10	CO3	K5

5.a.	In an oil-to-water heat exchanger, the oil enters the exchanger at 100°C with a heat capacity rate of 3700 W/K. Water is available at 15°C and 0.6 kg/s. Determine the exit temperatures in parallel-flow arrangement for U = 500W/m2-K and surface area of 10 m2. Consider Cp= 1.88 and 4.19 J./g-K for Oil and water, respectively.	10	CO4	K3
6. a.	Illustrate regenerative heat exchanger? How does a static type of heat exchanger differ from Dynamic type? Explain the 'reduced length" and "reduced period' Method for 'determining regenerator performance.	10	CO3	K2
7.a.	Find out an expression of LMTD of a counter flow heat exchanger and describe how it affects the heat transfer in a Heat Exchanger	10	CO2	K2
8. a.	A counter-flow double-pipe heat exchanger is to heat the cold fluid from 30°C to 65°C at a rate of 2 kg/s. The heath ig is to be accomplished by hot fluid available at 100°C at a mass flow rate of 1 kg/s. The inner tube is thin-walled and has a diameter of 1.5 cm. Specific heat of the hot fluid is 10kJ/kgK and that of the cold fluid is 5 kJ /kgK. If the overall heat transfer coefficient of the heat exchanger is 640 W/m2 °C, analyse and determine the length of the heat exchanger required to achieve the desired heating.	10	CO1	K3

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