Total No. of Questions : 12]

SEAT No. :

P1535

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[4759]-47

B.E. (Mechanical)

INDUSTRIAL HEAT TRANSFER EQUIPMENTS

(2008 Course) (Semester-II) (Elective-IV) (402050 A)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers 3 questions from section-I and 3 questions from section-II.***
2) ***Answers to two sections should be written in separate answer-books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) What is the difference between longitudinally finned inner tube heat exchanger and multi tube hairpin heat exchanger. Illustrate the difference by Diagrams. **[9]**

b) Explain with the diagrams the arrangements of double pipe heat exchangers when they are arranged in series and in parallel. **[9]**

OR

Q2) In a shell - and - tube feed water heater, cold water at 15°C flowing at the rate of 180 kg/h is preheated to 90°C by flue gases from 150°C flowing at the rate of 900 kg/h. The water flows inside the copper tubes (d_i = 25mm, D_o = 32mm) having thermal conductivity k_W = 381 W/m K. The heat transfer coefficients on gas and water sides are 120 and 1200 W/m^{2}K. respectively. The fouling factor on the water side is 0.002m^2 K/W. Determine the flue gas outlet temperature, the overall heat transfer coefficient based on the outside tube diameter, and the true mean temperature difference for heat transfer. Consider specific heats C_p for flue gases and water as 1.05 and 4.19 J/G.K. respectively and the total tube outside surface area as 5 m^2. There are no fins inside or outside the tubes and there is no fouling on the gas side. **[18]**

P.T.O.

Q3) a) Explain the major parts of a shell and tube heat exchanger with a neat diagram. **[8]**

b) Explain the detail steps in Kern's method for finding the shell side heat transfer coefficient and pressure drop. **[8]**

OR

Q4) Explain in details the shell side pressure drop calculations computed with Bell-Delaware method. Provide diagrams to show the difference between entrance, internal and window drops. **[16]**

Q5) a) What are the characteristics of compact heat exchangers. **[8]**

b) What are the salient features of plate fin heat exchanger (PFHE)? **[8]**

OR

Q6) a) What are different forms of individually finned tubes? **[8]**

b) "Brazed aluminum PFHE are an obvious choice for cryogenic applications" - comment. **[8]**

SECTION-II

Q7) a) Define and describe direct contact type condenser. **[5]**

b) Explain Horizontal in tube condenser with figure. **[5]**

c) What is Evaporative condenser? Explain with figure. **[6]**

OR

Q8) a) Explain vertical shell side condenser. **[5]**

b) What is impingement plate? Why it is used? Explain one example with figure. **[5]**

c) Draw sketch and explain in brief Spiral condenser. **[6]**

Q9) a) Explain Direct-contact or Open Evaporative cooling tower in brief. **[8]**

b) How cooling tower is to be maintained in good working condition. **[8]**

OR

Q10)a) The cooling used in a power plant consists of 10 big fans. The quantity of cooling water circulated through tower is 100Kg per minute and it is cooled from 35°C to 30°C. The atmosphere conditions are 35°C DBT and 25°C WBT. The air leaves tower at 30°C and 90% RH. Find capacity of each fan in cubic meter per minute. **[8]**

b) Enlist factors to be considered during selection of pump for cooling tower. **[8]**

Q11)a) Explain with the help of neat sketch the construction and working of Heat pipe. **[10]**

b) Write a short note on: **[8]**

i) Working fluids used in heat pipes.

ii) Wick structure used in heat pipes.

OR

Q12)a) State advantages of forced electronic cooling. **[6]**

b) Explain liquid cooled PCB. State its advantages and disadvantages. **[6]**

c) State use of different materials for better cooling in cabinets. **[6]**

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