

Total No. of Questions : 12]

SEAT No. :

P1535**[4759]-47**

[Total No. of Pages : 3

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 ($d_i = 25\text{mm}$, $D_o = 32\text{mm}$) having thermal conductivity $k_w = 381 \text{ W/m K}$. The heat transfer coefficients on gas and water sides are 120 and 1200 $\text{W/m}^2\text{K}$. respectively. The fouling factor on the water side is $0.002\text{m}^2 \text{ K/W}$. 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]

