



Rahul Saha 415/2023 (M)  
Channel Roll no. ....

राष्ट्रीय प्रौद्योगिकी संस्थान, हमीरपुर

National Institute of Technology, Hamirpur

B. Tech. (Chemical Engineering) - 4<sup>th</sup> Semester

End Semester Examination (4<sup>th</sup> May, 2023)

CH – 221 Heat Transfer

65

Duration: 3 Hours

Max. Marks: 50

Note

- Attempt all questions and make suitable assumption if required
- Wherever necessary, draw simple and neat diagram.
- Assign proper and correct answer number for each attempted question

1. Explain the following terms

(2 x 7 = 14 Marks)

- a) Difference between Biot number and Nusselt number
- b) Significance of LMTD
- c) Effectiveness NTU Method
- d) Duhring Rule and Fouling factor
- e) Film and dropwise condensation
- f) View Factor and Reciprocity Relation
- g) Natural and forced convection

2. A thin aluminum sheet with an emissivity of 0.1 on both sides is placed between two very large parallel plates that are maintained at uniform temperatures  $T_1 = 800$  K and  $T_2 = 500$  K and have emissivities  $\epsilon_1 = 0.2$  and  $\epsilon_2 = 0.7$ , respectively, as shown in figure 1. Determine the net rate of radiation heat transfer between the two plates per unit surface area of the plates and compare the result to that without the shield.

Data - ( $\sigma = 5.67 \times 10^{-8} \text{ W/m}^2 \cdot \text{K}^4$ )

(6 Marks)

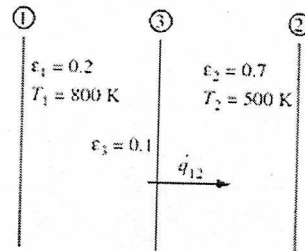


Figure 1 – Schematic representation for the above example

3. What is capacity and economy in evaporator? Explain double effect evaporator with feed forward, backward and mixed conditions with neat diagram and mention advantages of each. (8 Marks)

4. Explain pool boiling curve in detail with neat diagram. Also explain flow boiling curve for flow of fluid forced inside a heated tube with proper label diagram. (10 Marks)

5. Answer the following questions

- a) Derive the steady state equation of heat transfer through a composite wall. (6 Marks)
- b) Mention and explain the general steps followed in designing a heat exchanger (6 Marks)