



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-II Summer 2025	
Exam Seat No.:	
Academic Year: 2024-2025	Semester: VI
Class: TY	Program: B. Tech Chemical Engineering
Branch Code: CHE	Pattern: 2022
Name of Course: Heat Transfer Operations	Course Code: CHE223015(A)
Max. Marks: 30	Duration: 01.15 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 01 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last column indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1 a) Elaborate the Optimum thickness of insulation and Critical Radius of Insulation with their significance (7) CO1

Question No. 2

- 2 a) 1. Derive the expression for the Overall Heat Transfer Coefficient (U_o) for heat Transfer across the tube having ID r_i and OD r_o between Fluid A flowing inside the tube with heat transfer coefficient h_i and Fluid B flowing outside the tube having heat transfer coefficient h_o . (05 marks) (8) CO1, CO2
2. List the names of insulations used in chemical Industries and the properties of good insulating materials. (03 marks)

OR

- 2 b) A thick walled tube of stainless steel (Thermal conductivity $k = 19 \text{ W/m}^\circ\text{C}$) with 2 cm inner diameter (ID) and 4 cm outer diameter is covered with a 3 cm layer of Asbestos insulation ($k = 0.2 \text{ W/m}^\circ\text{C}$). If the inside wall temperature of pipe is maintained at 600°C and outer surface temperature is 100°C , calculate the heat loss per meter length. Also calculate the tube-insulation interface temperature. (8) CO1

Question No. 3

- 3 a) Describe the stage wise procedure of Thermal Design of shell and tube heat Exchanger (Kern's Method). (7) CO2

Question No. 4

- 4 a) 1. Classify the various types of condensers with neat sketch (04 marks) (8) CO2
2. What is De-superheating and sub-cooling in condensers (04 marks)

OR

4 b) 1. Differentiate between total condenser and partial condenser. (04 marks)

(8) CO2

2. Explain kettle type Reboiler with neat sketch. (04 marks)

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