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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Bioprocess Equipment Design and CAED

Time: 4 hrs.

Max. Marks: 100

Note: 1. Answer any ONE full questions from the following.
 2. Use of Perry's chemical Engineer's hand book permitted.
 3. Use of IS2825 also permitted.

- 1 Design 1-2 shell and tube heat exchanger to cool 27.8 kg/s of methyl alcohol from 95° C to 40° C using water as coolant. Water is heated from 25° C to 40° C. Use 16 BWG thickness having outer diameter of 1 inch length of 16 feet arranged on 1 $\frac{1}{4}$ inch triangular pitch. Take $U_d = 340.7 \text{ W/m}^2\text{K}$.
 - a. Design 1-2 shell and tube heat exchanger with all details. (50 Marks)
 - b. Calculate the pressure drop on both of the fluid. (20 Marks)
 - c. Draw the sectional elevation of heat exchanger showing all details. (20 Marks)
 - d. Show the details of tube sheet layout. (10 Marks)

- 2 28000 kg/hr pure alcohol vapour at 1 atmospheric pressure is to be condensed using water available at inlet temperature of 25° C and leaving at a temperature of 50° C as cooling media. The water is flowing through the tube with velocity of 1.1 m/sec and are laid on triangular pitch arrangement. The available tubes are $\frac{3}{4}$ inch diameter and 18 BWG thick, 4 m long are available having $\frac{15}{16}$ inch pitch.
 - a. Design the condenser for required size with all details. (50 Marks)
 - b. Calculate the pressure drop for both stream. (20 Marks)
 - c. Draw the sectional elevation of condenser showing all details. (20 Marks)
 - d. Show the details of tube sheet layout. (10 Marks)

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