CBCS SCHEME

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BBT515D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Bioprocess Equipment Design and CAED

Time: 4 hrs. Max. Marks: 100

Note: 1. Answer any ONE full question from the following.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of Perry's Data book is permitted.

			M	L	C
Q.1		Design 1 - 2 shell and tube heat exchanger to cool 30 kg/s of methanol from 120°C to 60°C using water as coolant. Water is heated from 40°C to 60°C. Use 16 BWG thickness having outer dia of 1 inch, length of 10 m arranged on $1\frac{1}{4}$ inch triangular pitch. Design 1 - 2 STHE with all details. (Take u_d = 340.7 W/m^{2}K).			
	a.	Calculate area of heat transfer and design STHE for given data.	50	L1 L2	CO2
	b.	Calculate the pressure drop on both sides of the fluid.	20	L4	CO3
	c.	Draw the sectional elevation of STHE showing all details.	20	L2 L3	CO1 CO2
	d.	Show the details of tube sheet layout.	10	L3	CO2
		OR			
Q.2		2500 kg/hr of pure ethanol slightly above atmospheric pressure is to be condensed using water as coolant and is available at 25°C and leaving at 50°C. Calculate the required size of the vertical condenser by considering following data : (i) Outer dia of tube is 25.4 mm (ii) Thickness of tube is 2.6 mm and length is 3.3 m. (iii) Select triangular pitch and assuming water velocity 2 m/s. Using above data and design considerations required.			
	a.	Design a vertical condenser.	60	L1 L2	CO1
	b.	Calculate the pressure drop on each side.	20	L4	CO2
	c.	Draw the sectional elevation of vertical condenser and list out the parts.	20	L2 L3	CO3

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