

CBCS SCHEME

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15BT64

Sixth Semester B.E. Degree Examination, June/July 2018 Bioprocess Equipment Design and CAED

Time: 4 hrs.

Max. Marks: 80

Note: 1. Answer any ONE full question.
2. Use of Perry handbook is permitted.

- 1 Design a 1–2 shell and tube heat exchanger for 10,000 kg/hr of hot fluid from 90°C to 45°C using cold fluid. The cold fluid is heated from 30°C to 42°C. The coolant flows through the tubes 1 inch, 16 BWG, 4m length in a triangular pitch of 1 inch, 25% cut segmented baffles are to be used and baffle spacing 215mm. The overall heat transfer coefficient will be 450 W/m²k. Check the pressure drop on both sides. (50 Marks)
- Draw :
- The sectional front view of the heat exchanger (20 Marks)
 - Details of tube sheet layout. Assume the physical properties of water for both fluids. (10 Marks)
- 2 Enzyme E catalyses the fermentation of a substrate A to product R. Mixed flow reactor is required to handle 25 lpm of a feed stream containing reactant (2 moles/lit) and enzyme 95% conversion is required. The kinetics of fermentation at this enzyme concentration is given by
- $$-r_A = \frac{0.1C_A}{1+0.5C_A} \frac{\text{moles}}{\text{lit} \cdot \text{Min}}$$
- Design the reactor or fermentor and also determine the power required for mixing. Operating conditions are 1 atm and 30°C. Properties of fluid can be taken as that of water. Materials of construction is stain less steel (SS -- 304) for all parts. (60 Marks)
 - Draw to scale sectional front view of reactor. (20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.