R09

Code: 9A23702

### B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013
# PROCESS EQUIPMENT DESIGN IN BIOTECHNOLOGY
(Biotechnology)

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　　　　　　　Max Marks: 70

PART - A
Answer any FIVE questions　　　　　　　　　　5 x 4 = 20 M

1.　　　　Discuss forced circulation evaporator with the help of a schematic diagram.

2.　　　　Discuss pipeline design for transportation of solvents.

3.　　　　Develop design equation for a steady state plug flow reactor.

4.　　　　Write short notes on using schematic diagram.
　　　　　(a) Weeping.　　(b) Flooding.　　(c) Coning.　　(d) Excessive entrainment.

5.　　　　Discuss the different steps in the design of absorption column.

6.　　　　Draw the simple sketch of series and parallel arrangement of double pipe heat exchanger.

7.　　　　Write down the application of various dryer in bioprocess engineering.

8.　　　　Explain the Shell and Baffles design of heat exchanger.

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PART - B

Answer any ONE question      1 x 50 = 50 M

1. Design a double pipe heat exchanger is used to cool aniline from $90^0C$ to $65^0C$. The area of heat transfer is 10 square meters. The aniline flow rate is 4500 kg/h. Toluene at $37^0C$ flowing at the rate 3900 kg/h is used to cool aniline in counter current flow. Assume the flow is counter current flow. Assume suitable assumption wherever necessary.
Data:
The average specific heat of aniline is 2.15 kJ/kgK
The average specific heat of toluene is 1.85 kJ/kgK.
The overall heat transfer coefficient.
If the dirt factor is 0.0003 $m^2$ K/W.

2. A continuous fractionation column has been installed to distill 30,000 kg/hr of a mixture of 40% benzene and 60% toluene (by weight). The overhead and bottom products are found to contain 97% benzene and 97% toluene respectively. The feed consists of $3/4^{th}$ vapor and $1/4^{th}$ liquid. A reflux ratio of 3.5 has been used.
Design a suitable distillation column under these conditions.
Assume suitable assumption wherever necessary.

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