AE 335

Separation Processes

Problem Set 7 Solutions (Numerical answers only)

- 1. The total recovery fraction of the enzyme alcohol dehydrogenase is 0.9873
- The weight fraction of acetic acid in the outlet heptanol phase is 0.0075 The number of equilibrium stages are approximately 33-34 stages
- The outlet weight fraction of acetic acid in benzene is 0.000138 The outlet weight fraction of acetic acid in water is 0.00363
- 4. The composition of the raffinate phase is

 $x_{\rm acetic \ acid} = 0.23 \,, \ x_{\rm water} = 0.73 \,, \ x_{\rm isopropyl \ ether} = 0.04$

The composition of the extract phase is

 $y_{\rm acetic \; acid} = 0.12 \;,\; y_{\rm water} = 0.04 \;,\; y_{\rm isopropyl \; ether} = 0.84$

The flow rate of the solvent is approximately 86 kg/h

- 5. The flow rate of the solvent is approximately 483 kg/h
- 6. The flow rate of the solvent is approximately 2,500 kg/h The number of equilibrium stages is approximately 2 stages
- 7. The solvent flow rate is approximately 5,600 kg/h The flow rate of the outlet extract phase (E_1) is approximately 6,830 kg/h The flow rate of the outlet raffinate phase (R_N) is approximately 770 kg/h
- 8. The weight fraction of acetic acid in the outlet extract phase is 0.18 The flow rate of the outlet extract phase (E_1) is approximately 147 kg/h The flow rate of the outlet raffinate phase (R_N) is approximately 64 kg/h The number of equilibrium stages is approximately 2-3 stages
- 9. The composition of the extract phase is

 $y_{_M}=0.06\,,\;y_{_H}=0.05\,,\;y_{_{\rm A}}=0.89$

The composition of the raffinate phase is

 $x_{_{\!M}}=0.42\,,\;x_{_{\!H}}=0.48\,,\;x_{_{\!A}}=0.10$

The flow rate of the outlet extract phase is approximately 214 kg/hThe flow rate of the outlet raffinate phase is approximately 136 kg/h