Chemical Unit Operations II. 2017.12.18. second repeat

**Name:**

**Neptun code:**

1. An equilibrium reaction is performed in a continuous stirred tank reactor. Type of reaction: A+BC+D The reactor has an active volume of 0.25  m3, the feed stream number 1 has a volumetric flow rate of 12 dm3/min and it contains 1.2 mol/dm3 A, 0.02 mol/dm3 C and 0.02 mol/dm3 D component The feed stream number 2 has a volumetric flow rate of 18 dm3/min and it contains 1.1 mol/dm3 B component and 0.1 mol/dm3 A component Value of k1 is 15 dm3/(mol∙min) and of k-1 is 3 dm3/(mol∙min) at 60°C and value of k1 is 10 dm3/(mol∙min) and of k-1 is 1 dm3/(mol∙min) at 30°C. Is it possible to produce 18 kmol C product daily at 40 °C (there is no by-product )? (50 point)

k1

k-1

1. At atmospheric pressure 1.2 kmol/h phenol and metacresol mixture (55 mol% phenol content) is distilled in a packed distillation column. According to the measurements if the reflux ratio is 6, the metacresol contamination int he phenol stream is 10 mol%, while the phenol content of the metacresol stream is 6 mol%. The column is installed with a partial reboiler. The feed is 20% vapour, 80% liquid, its position is optimal.
2. Determine the HETP value if the height of the packing is 3.2 m! (30 points)
3. Diameter of the column is 25 cm. Calculate the load factor at the bottom of the column! Pressure drop of the column is negligible. (20 points)

For numerical intergation 6 points are enough.

### Phenol – metacresol

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| --- | --- | --- | --- |
|  |  | **Phenol** | **3-metilphenol** |
| **Antoine-constants** | ***A*** | 6.93051 | 6.76147 |
| ***B*** | 1382.65 | 1355.92 |
| ***C*** | 159.493 | 146.73 |
| ***M* [g/mol]** | | 94 | 108 |
| ***Tfp* [°C] (*p* = 1 atm)** | | 181.9 | 202.7 |

Diagrams valid at 1 atm



