Exam No. 1 (Process Modelling)
ITESM
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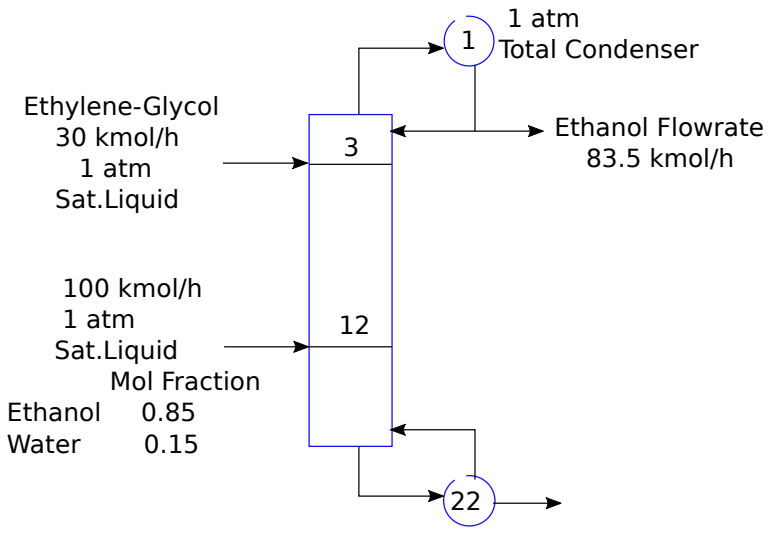
The ethanol/water mixture forms an azeotropic composition point at around 87% ethanol mol fraction. This thermodynamic behavior leads to a situation where high-purity ethanol recovery (i.e. 99% ethanol mol fraction) cannot be achieved by conventional distillation unless some distillation modifications are considered. One of such modifications consists in using an entrainer whose aim is to break the ethanol/water azeotrope allowing high-purity ethanol recovery. In the following figure a flowsheet of a typical extractive distillation column, using Ethylen-Glycol as entrainer, and processing conditions are shown:



- Using the **Design Specs** facility available in ASPEN, compute the reflux ratio such that the resulting ethanol recovery is 83.5 kmol/h.
- In this part you are asked to analyze the impact on process economics (as measured by the reboiler thermal duty) of the following design variables: (a) Flowrate of entrainer, (b) Column pressure, (c) Feed tray location of the ethanol/water feed stream and (d) Feed tray location of the entrainer flowrate. Be sure to meet ethanol product specification and clearly state your conclusions. You should present your results either as tabular or graphical patterns.