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# NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
## DEPARTMENT OF CHEMICAL ENGINEERING
### B.Tech III Semester Examination
### Test II October 2013
### CH2002-PROCESS CALCULATIONS

Name:

Register No:

**Time: 1 hour**

**Maximum Marks: 20**

1. Write a note on:
   a) Limiting reactant with example (1)
   b) Selectivity (1)
   c) Bypass with diagram (1.5)
   d) Purge with diagram (1.5)

2. One hundred moles of a hydrocarbon mixture consisting of 20% ethane, 40% propane and 40 % butane is admitted to the first column of a series of two distillation columns. The top product from this column contains 95% ethane, 4% propane and 1% butane. The bottom product enters the second column in the series where it is subjected to further purification. The distillate leaving the second column is 99% propane and 1% butane and the bottom product is 8.4% propane and 91.6% butane. Calculate:
   (a) composition of the bottom product from the first column
   (b) the quantity of the distillate from the second column (3.5)

3. In a particular drying operation , it is required to have the moisture content of feed to a calciner at 15% by weight in order to prevent lumping and sticking. This is achieved by mixing the feed having 30% by weight moisture with a recycle stream of dried material having 3% by weight moisture. The drying operation is shown in fig. Find the fraction of dried product that must be recycled. (4)
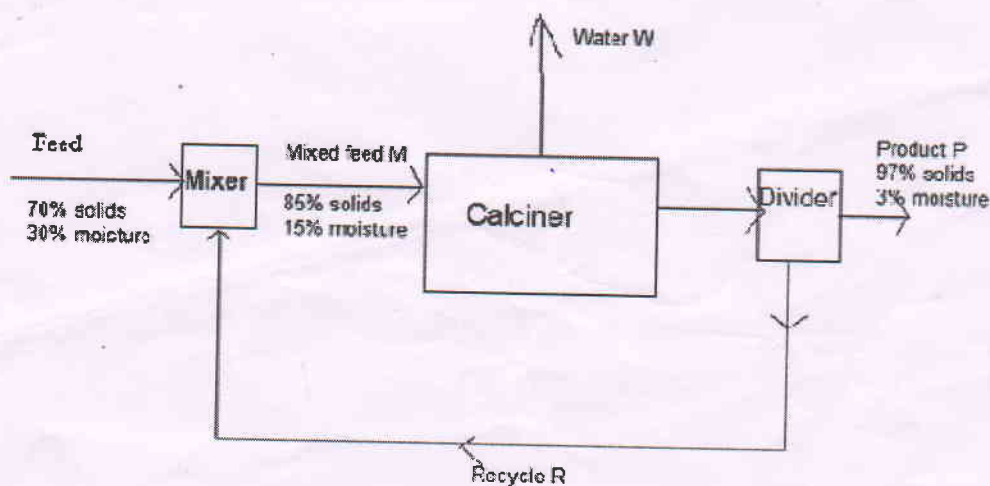
4. In the manufacture of acetic acid by oxidation of acetaldehyde, 100kmol of acetaldehyde is fed to reactor per hour. The product leaving the reactor contains 14.81% acetaldehyde, 59.26% acetic acid, and rest oxygen (mole basis). Find the percentage conversion of acetaldehyde.

$CH_3CHO + \frac{1}{2} O_2 \rightarrow CH_3COOH$ (3.5)

5. In the preparation of cooking liquor for a suiphite pulp mill, an absorption tower is used for absorbing $SO_2$ in a weak liquor. The weak liquor enters the tower at a rate of 20 $l/s$ from top with $SO_2$ concentration of 0.5% by weight and leaves from bottom with $SO_2$ concentration of 1% by weight. The gas stream entering the bottom of the tower (flowing in counter current fashion with respect to weak liquor) contains 17% by volume $SO_2$. When the gas leaves tower from top, 75% of $SO_2$ gets absorbed. The pressure in the tower becomes 50 kPa guage pressure and operates isothermally at 308 K. Assuming that the liquor has a specific gravity of 1.0, calculate: (i) Molar flow rate of entering gas
(ii) volumetric flow rate of entering gas. (4)