

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)**

CLASS: BE
BRANCH: BIOTECHNOLOGY

SEMESTER: V
SESSION : MO/2018

SUBJECT : BT5023 CHEMICAL ENGINEERING III

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

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- Q1 (a) What is the value of 'q' for saturated liquid and saturated vapour feed? [2]
(b) A mixture of benzene and toluene of 50 mole % each is flash distillate at 1 atm pressure. [3]
The feed is heated to a temperature to flash 40% of it. What will be the composition of vapor and liquid leaving the flash chamber? Relative volatility is 2.45.

- Q2 (a) Draw the temperature concentration diagram at constant pressure with its significance. [2]
(b) Draw a labeled diagram of a distillation column with reflux. [3]

- Q3 A plant must distill a mixture containing 75 mole % methanol and 25 mole % water. The overhead product is 99.9 mole % methanol and bottom product is 0.2 mole % methanol. If $q = 1.5$, $\alpha = 3.32$ and R_D is 1.4, calculate, (a) minimum number of theoretical plates. [5]

X	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Y	0.42	0.58	0.67	0.73	0.78	0.82	0.87	0.91	0.96	1

- Q4 Adsorption of an enzyme on cellulose follows Langmuir model. The maximum uptake is 70 mg/g adsorbent. Half of this maximum at the solution concentration of 50 mg/L of enzyme. We have 1.5 L of feed containing 220 mg/L of enzyme. How much cellulose do we need to add to obtain 90% recovery of the enzyme? [5]

- Q5 (a) Write the equation of the Langmuir and Freundlich adsorption isotherm models. [2]
(b) Write a note on different adsorbents used in practical purpose. [3]

- Q6 (a) Write the difference between isopycnic and rate zonal gradient centrifugations. [2]
(b) If bacterial cell debris has $Gt = 54 \times 10^6$ sec, and the centrifuge bowl diameter is of 10 cm, [3]
what centrifuge speed is needed to effect a full sedimentation in two hours.

::: 11/09/2018 :::E