AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2025-2026 Monsoon

CHE204 Mass Transfer Operations-I
End-Term Examination
29th November, 2025, Saturday, 5.00 PM – 7.00 PM

Name:	Roll no.	A U							Marks 50

Write your answers on the answer book. Answer all questions. Numbers on the right indicate marks for respective question. Assume suitable data wherever necessary and specify it clearly in your answers. Graphical problems should be solved on graph papers wherever mentioned

1. Benzene (A) is to be freed from light oil (B) by absorbing with wash oil. The absorber gas (benzene+light oil) enters the absorber at 26 C at a flow rate of 0.35 m3/s at a total pressure of 1.07×10^5 N/m^2 (803 mm Hg) containing 1.8% by volume of light oil vapors. The light oil will be assumed to be entirely benzene and a 96% removal is required. The wash oil is to enter at 26 C containing 0.0025 mole fraction benzene and has an average molecular weight of 260. An oil circulation rate of 1.5 times the minimum is to be used. Wash oil-benzene solutions are ideal. The temperature will be constant at 26 C vapor pressure of benzene is 100 mmHg (13330 N/m^2). Compute the oil circulations rate and number of theoretical stages. Note: It is mandatory to determine both things asked in the question using graphical method on a graph paper *20 M*

2. Consider a continuous counter current drier with a moisture content of 0.25. The flowrate of the solids is 120 kg/hr while air enters at the opposite end counter currently at 100 C and 12000 kg/hr. The moisture content of the inlet air is 0.02. The solids are to be removed at 65 C and 1% moisture content. The temperature of the wet solids entering the dryer is approximately equal to adiabatic saturation temperature of air leaving the drier. The solids remain at saturation temperature in region I and the critical moisture content at the start of region II is 0.087. You have to do the following: 1. Draw a detailed block diagram and 2. Find (a) the heating time of region III and (b) humidity's in all regions. *20 M*
The following data is given: Ky = 150 kg/m2 hr; Surface area a' = 0.063 m2/kg dry air; Cp,dryair = 1.005 KJ/kg; Cps = 0.96 kJ/kg K; Enthalpy difference in region 3 = 144 KJ/kg. Humidity data except for air is on wet basis

3. In a drying operation the moisture content of solids is to be decreased from 25% to 6% under conditions identical to those for which the current drying curve applies. The details are given in the table below: *10 M*

N x 10^3 (kg/m2s)	0.3	0.3	0.15	0.13	0.1	0.03
X (kg moisture/ kg dry solids)	0.3	0.2	0.1	0.085	0.075	0.068

Total weight of solids per m^2 area is 40. If all variables are as per dry basis, find the time required for constant and falling rate period and the total drying rate period. Do not calculate the non-linear drying rate.