GATE 2021 Chemical Engineering Memory-Based Questions

In a batch doing experiment a solid with a critical moisture content of 0.2kg water / kg dry solid is dried from an initial moisture content of 0.35 kg water / dry solid to a final moisture content of 0.1 kg water/ kg dry solid in 5 hours. In the constant rate regime, the rate of drying is 2 kg water / kg dry air. The entire falling regime is assumed to be zero. The mass of dry solid per unit area is ____ kg/ m^2. **Ans.** 35	A binary liquid mixture consists of two pieces 1 and 2, let $\boldsymbol{\gamma}$ and x represent the activity coefficient. using a molar excess Gibbs free energy model ln $\boldsymbol{\gamma}_1$ vs x_1 and ln $\boldsymbol{\gamma}_2$ vs x_1 are plotted. A tangent drawn to the ln $\boldsymbol{\gamma}_1$ vs x_1 curve at a mole fraction of $x_1 = 0.2$ ha slope = 1.728. The slope of the tangent drawn to the ln $\boldsymbol{\gamma}_1$ vs x_1 curve at the same mole fraction _____? **Ans.** 0.432
A distillation column handling a binary mixture of A and B operating at total reflex. It has two ideal stages including the reboiler. The mole function of the more volatile component in the residue is 0.1. The average relative volatility α_{AB} is 4. The model fraction of A in the distillate is **Ans.** 0.64	A gaseous mixture of 1 bar and 300K consists of 20 mol% CO_2 and 80 mole% insert gas. Assume the gas to be real. R = 8.314 J/mol.K. The magnitude of minimum work done required to separate 100 mol of this mixture at 1 bar and 300K into pure CO_2 and the insert gas at the same temp and pressure is ____ kJ. **Ans.** 125
A process has a transfer function G(s) = Y(s) / X(s) = 20 / $900000s^2$ + 240s + 1. Initally the process is at a steady state with x(t=0) = 0.4 and y(t=0) = 100. If a step charge in x is given from 0.4 to 0.5. The maximum value of y that will be observed before it reaches the new steady state is ____. **Ans.** 0.254	The inherent characteristics of three control values P, Q and R. The correct option is/are – A. P is an equal % valve B. Q is quick opening valve C. P is quick opening valve D. R is an equal % valve **Ans.** Options C and D are correct.
In a solvent regeneration process, a gas is used to strip a solute from the liquid in counter-current packed bed tower operating under isothermal condition pure gas is used in this striping operation. All solution is diluted and Henry's law is applicable here y mole fraction of solute in the gas phase in equilibrium with the liquid phase of solute mole fraction x, and M is the Henry Law constant. Let x_1 be the mole fraction of the solute in the leaving liquid, and x_2 be the mole fraction of the solute in entering liquid when the value of the ratio of the liquid to gas molar flow rate is equal to M, the overall NTO_l is given by – **Ans.** $x_2 – x_1 / x_1$	