

DEPARTMENT OF CHEMICAL ENGINEERING

Major Exam. CHL 807 Population Balance Modelling

Max. Marks: 40

Max. Time: 2 Hrs

- Q.1. (i). Define "internal coordinates" of a particle-size distribution. (2 marks)
(ii). Define "particle-phase space" of a distribution in general, and of CSD in particular. (4 marks)
- Q.2. (i). How many characteristic sizes does a highly irregular particle have? (1 mark)
(ii). What are five most important problems in operation of industrial crystallizers? (2 marks)
(iii). Can supersaturation alter crystal habit? (1 mark)
(iv). Can supersaturation alter crystal purity? (1 mark)
(v). What four factors should remain invariant with change in scale of process? (2 marks)
- Q.3. Prove $k_a = 6 k_v$ for equidimensional, geometrically similar particles. (4 marks)
- Q.4. Calculate the j^{th} moment of normal distribution. (5 marks)
- Q.5. Show moment transformation of population balance equation. (5 marks)
- Q.6. Write moment equations of isothermal, plug-flow crystallizer together with mass balance, crystallization kinetics, and side conditions. (5 marks)
- Q.7. How will you recover distribution function from moment equations using the matrix method? (3 marks)
- Q.8. Analyze the effect of secondary nucleation on CSD. Specifically, how do growth rate and nuclei population density vary with suspension density, M_T ? What about the linear secondary nucleation effect? (5 marks)
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