

CONCLUDING REMARKS

A method for the design of a cascade of CSTRs (isothermal and non-isothermal) has been proffered. The required level of mathematical rigor appears suitable for undergraduate instruction in optimal reactor design. Also, the procedure is particularly amenable, even at that level, for computer coding.

NOMENCLATURE

- A_1, A_2 = frequency factors in the Arrhenius relation
 $C_{A,B,R,S}$ = concentrations of species A, B, R, S respectively, mol/lit
 E_1, E_2 = activation energy in the forward and backward directions respectively, J/mol
 F_{A0} = feed molar flow rate, mol/min
 J = Jacobian matrix
 k_1, k_2 = rate constants in the forward and backward directions respectively
 $-r$ = rate of reaction, mol/lit. min
 R_g = universal gas constant, J/mol K
 T = temperature, K (subscripts are obvious from text)
 V = reactor volume, lit
 X = fractional conversion
 α_i = reaction order w.r.t. reactant i
 β_j = reaction order w.r.t. product j
 $\theta_{A,B,R,S}$ = feed concentration ratio of species A, B, R, and S to that of A
 $v_{A,B,R,S}$ = stoichiometric coefficient ratio of species A, B, R, and S to that of A
By convention v is negative for reactants and positive for products. Consequently, $v_A = -1$, $v_B = -b/a$, and $v_R = r/a$. Similarly, $\theta_A = 1$ and $\theta_B = C_{B0}/C_{A0}$, etc.

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AN INTRODUCTION TO NUMERICAL METHODS FOR CHEMICAL ENGINEERS

by James B. Riggs

Texas Tech University Press, Lubbock, TX 79409-1037; 460 pages (includes Solutions Manual)(1988)

Reviewed by

R. Narayanan

University of Florida

This book is meant primarily for undergraduate students in chemical engineering. It could be used by other engineering students even though the physical connection of the majority of the examples is related to chemical engineering. It is aimed at students who have some background in calculus and some differential equations—the student would typically be in the junior or senior year of chemical engineering.

I found the book well structured. It deals with matrix operations and inversion with clarity and with minimum confusion. The examples from stage-wise operations are delightful, and the chapter on single nonlinear equations is well presented. However, some elementary derivations on sufficient conditions for convergence of the methods and the errors would have been possible but were (unfortunately) omitted.

The section on multiple nonlinear equations was adequate, but the geometric interpretation of Newton's method was needlessly confusing. Also, the chapter on polynomial approximations and integration could have been strengthened by inclusion of error bounds, and a section on Richardson's extrapolation method should be included in any future edition.

I liked the chapters on ordinary and partial differential equations and the subsequent treatment on boundary value problems. The chemical engineering examples were particularly good. One of the most useful chapters for students, I feel, deals with linear and nonlinear regression.

In short, I feel that the book is thoughtfully written. Its main weakness is that it lacks some theoretical background (which can be provided by an instructor without much ado). Its strengths are the apt chemical engineering examples that are provided, and in this regard, I find it a suitable alternative to other well-established textbooks. I found the level appropriate for our junior-level students and feel it can be taught without essential knowledge of the main chemical engineering courses. It is published by a relatively unknown press and does not appear to have received the publicity it deserves. □