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NASA Pasadena Office

JPL Transient Radiation Analysis by Computer Program [JTRAC]

The problem:

The prediction and verification of the performance and reliability of complex semiconductor electronic systems are of the utmost importance. The equations describing the systems are complex and nonlinear which makes solution difficult even when many simplifying assumptions are made.

The solution:

JPL Transient Radiation Analysis by Computer Program (JTRAC) is a digital computer program which simulates the time response of an electronic circuit to arbitrary forcing functions which may include electrical and/or radiation stimuli.

How it's done:

The program is designed to solve the linear and nonlinear simultaneous equations which characterize the mathematical models used to predict circuit response for electrical and/or radiation input. The user describes the system by entering the circuit topology and component parameters in a free-format, engineer-oriented language. The program then translates the input, generates the equations, and finds the solution automatically.

The program contains a standard model library for resistors, capacitors, inductors, diodes, transistors, and grounded and floating voltage sources. A parameter library for diodes and transistors is also computer accessed. Nonstandard models may be constructed by using the standard models. Time functions may be described with straight line segments. The initial conditions may be input by the user or calculated by the program.

Standard program simulation results are presented by printout and printer plots. The plots may be presented in the following form:

a. Variable (node voltage, branch current, or the like) vs. time,

b. Variable derivative vs. variable value (phase plane plots), and

c. One variable vs. another variable.

The user enters the standard information as data which are read by the program. When the standard features are not sufficient for the problem at hand, nonstandard features may be implemented with a user-coded subroutine. FORTRAN algebraic equations and control statements may be coded to modify standard model parameters, to augment the standard models, to create nonstandard models, and to create additional time functions.

Notes:

1. This program was written in FORTRAN V for the UNIVAC 1108 computer under the EXEC VIII operating system.

2. Inquiries concerning this program should be directed to:
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   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30601
   Reference: NPO-13470

Categories: 09 (Mathematics and Information Sciences)
02 (Electronics Systems)