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**Device CAD
Expands its
Role**

In this issue:

- New-Wave Filters Boost DSP
- Designing On-Chip PLLs
- Fiber Optic Sensors Get Smart

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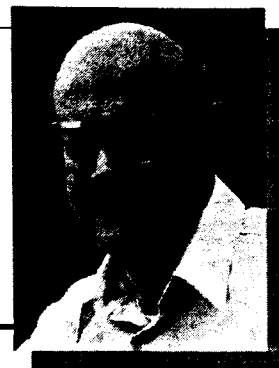
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PC Programs for Engineers

Lawrence P. Huelsman, Editor



Welcome to the PCPE (PC Programs for Engineers) column. Our constant goal is to provide information on programs useful to the engineering community. If you have developed a program which you would be willing to share with other readers, please send three copies (on three separate 360K, 5.25-inch disks) so that I can have it reviewed and described in the column. We also encourage you to provide one disk containing any supporting line art (circuit schematics, etc.), and raw graphics files that display the on-screen output of the program. In this issue, we discuss two programs. The first of these is **FILTER**, certainly one of the most full-featured and versatile approximation and active filter synthesis programs to be presented in this column.

Program: **FILTER**—Program for Analog Filter Design

Purpose: To provide a wide range of approximation and realization capabilities for active analog filters.

Information: Dr. B. M. Wilamowski
Department of Electrical
Engineering, University of Wyoming
Laramie, Wyoming 82071-3295
E-mail: WILAM@CORRAL
UWYO.EDU

Description: **FILTER** was developed by Bogdan M. Wilamowski, Stanislaw F. Legowski and John W. Steadman. Input is from the keyboard or from a file in which a former design has been stored. Output goes on the screen, to the printer or to a file. Major features of the program are:

- Filter data can be defined by a "brick wall" specification, filter order, filter transfer function or by pole and zero locations.

- Approximations are provided for Butterworth, Chebyshev, Inverse Chebyshev, Cauer elliptic, and Bessel-Thomas characteristics.
- Lowpass, highpass, bandpass and band elimination filter functions are implemented.
- Various graphical outputs, such as magnitude, phase, group delay, and transient responses for delta Dirac and unit step excitations.
- Manual and automatic pole and zero matching provided for cascade filter realization.
- Practical filter realizations are implemented using fifteen different first- and second-order active circuits with operational amplifiers.
- The program generates a SPICE file for circuit verification and for Monte Carlo analysis.
- Polynomial arithmetic is supported, in-

cluding root finding, continued fraction expansion, and partial fraction expansion.

Technical Data: The program is written in Turbo Pascal Version 6.0 for an IBM (or compatible) personal computer. A VGA, EGA, CGA or Hercules graphics card is required for the plot and circuit diagrams displays.

Licensing: The program is copyrighted. It may be freely used by individuals as long as no charge is made. All other rights are reserved.

Cost: The program is available on a 5.25-inch, 360K disk from Dr. L. P. Huelsman, Department of Electrical and Computer Engineering, University of Arizona, Tucson, Arizona 85721, for a shipping and handling charge of four dollars (\$4.00) US funds in the continental USA. Outside the USA the charge is \$6.00 (US

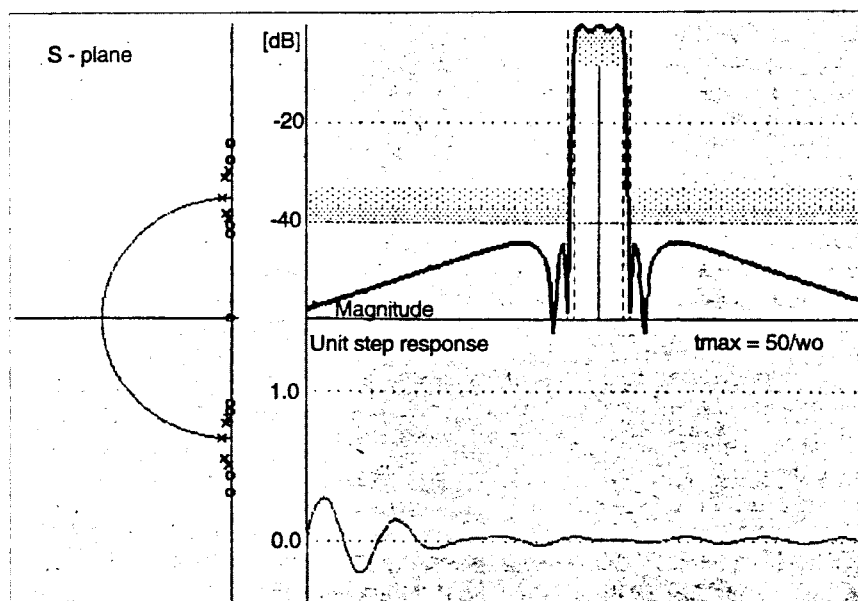
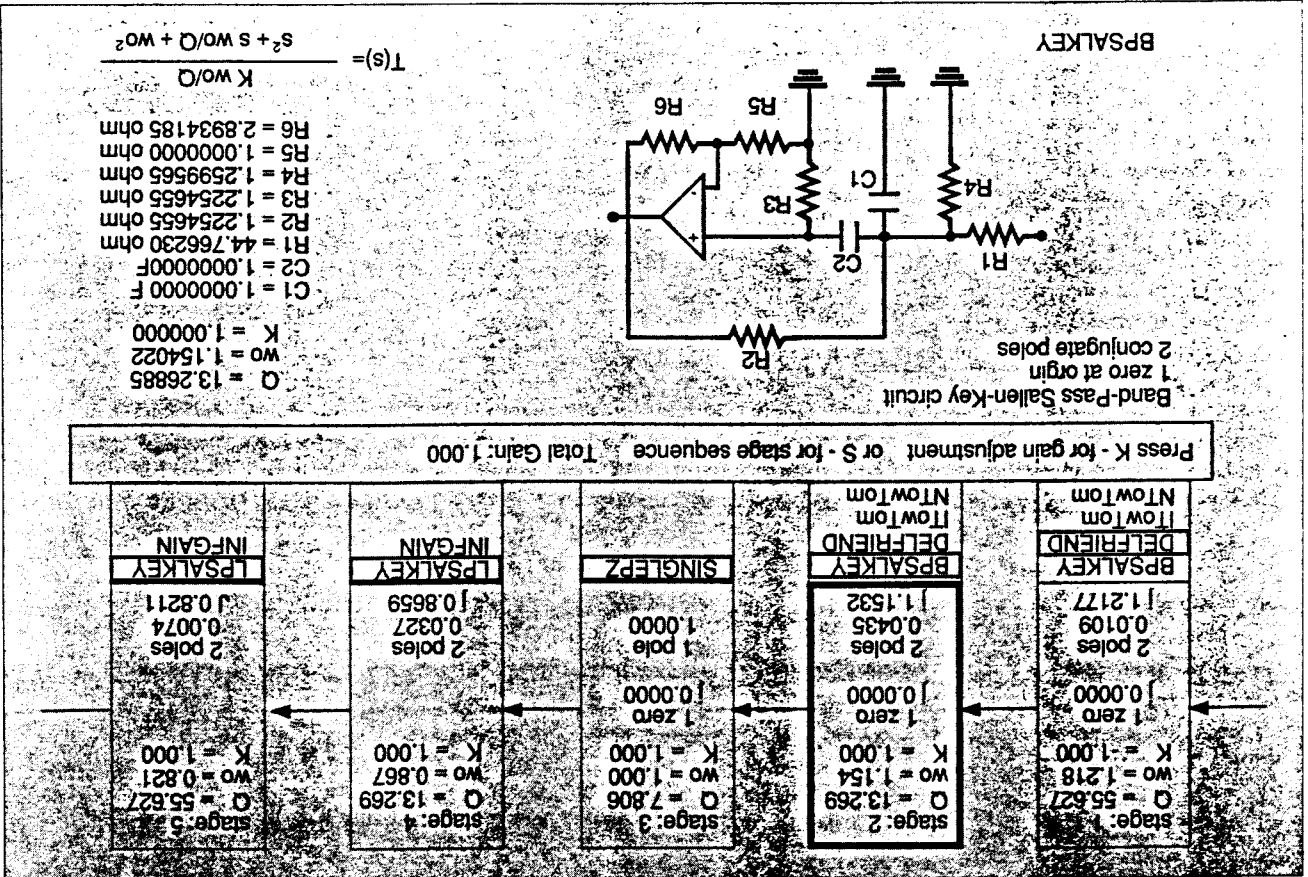


Figure 1

Figure 2



funds). Checks should be made payable to the University of Arizona.

gram follow:

SPICE (or PSpice). The details of the pro-

and current sources in the usual SPICE convention.

Technical Data: The program requires an EGA, VGA, or Hercules graphics card to display the plot of the circuit configuration.

Licensing: The program is copyrighted. It may be freely used by individuals as long as no charge is made. All other rights are reserved.

Information: Dr. Tayeb A. Guima
UF/UNF Electrical Engineering

Program
4567 St. Johns Bluff Road South
Jacksonville, Florida 32216-6699

Cost: The program is available on a 5.25-inch, 360K disk from Dr. L. P. Huelisman, Department of Electrical and Computer Engineering, University of Arizona, Tucson, Arizona 85721, for a shipping and handling charge of four dollars (\$4.00) US funds in the continental USA. Outside the USA the charge is \$6.00 (US funds). Checks should be made payable to the University of Arizona.

As an example of the use of the program consider the following input file:

R1 2 9
R2 2 4

The second program described in this issue is an interesting utility program that creates circuit diagrams from input files which have the general form suitable for

• Shows the reference polarity of voltage elements.
• Accepts resistors capacitors, inductors, and voltage and current sources as input program:

Description: The input to the program is a file containing element names and topological (node number) connection information for the elements of a circuit. The output is a screen display of a circuit which satisfies the input information. The

Some examples of the output options for the approximation are shown in Fig. 1. These include a screen display of the magnitude plot, the unit step response, and the s-plane plot of the pole and zero locations of the transfer function. One of the possible circuit realizations, using a bandpass Sallen and Key configuration, is shown in Fig. 2. The realization of the second stage of the filter (before denormalization) has been selected for display.