6. A → E|E; A

7. P → i|i(B)

8. B → E|E, E.

Grammar $G_1(b)$ is the same as $G_1(a)$ except that lines 5 and 7 are changed to

5. R → (E)|s[$_1$E)|f[$_2$A)|P, and

7. P → i|i{B).

Note that '@' represents the unary minus.

Table 3 is the precedence table for this grammar. Table 3 could be split into two tables, one with the relations of type 1, and another with relations of type 2.

The semantic routines to parse and translate input sentences are:

1. $\lessdot_{1,2}$: STACK Input; I = I + 1; TYPE = 1

2. $\doteq_1$: STACK Input; I = I + 1; TYPE = 1

3. $\doteq_2$: UNSTACK; I = I + 1

4. $\gtrdot_{1,2}$: OUTPUT Stack; TYPE = 2

5. TERMINATE.

6. — ERROR.

Routines numbered 6 and higher are error processing routines, dependent on the type of error detection and error recovery required from the expression analyser.

Note that

(i) ')' is never actually stacked, so that the row for ')' in the table can be deleted.

(ii) If the output required is not polish postfix for all cases, entries in the tables can be modified to reflect the required output. For example, 'f' can be outputted before the phrase is reduced without affecting the parse.

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Book reviews

Digital Design with Standard MSI & LSI by Thomas R. Blakeslee, 1975; 357 pages. (*John Wiley & Son Ltd*, £9·60).

Probably the most important point to make about this book is that it recognises fully how MSI and LSI techniques are natural partners with microcomputers. Consequently it can be reviewed as an addition to microcomputer literature, and a very welcome addition it is.

There are perhaps three major groups of readers who are interested in microcomputers. Those most able to appreciate their potential are existing computer scientists and engineers, who approach micros from the point of understanding how the semiconductor technologists have packed a quart in a pint pot. Often they concentrate excessively on the central processor aspects, and miss some of the very significant characteristics which are produced by the LSI support devices which accompany the processor.

The second class is made up of experienced industrial electronic designers who have suddenly been faced with microcomputers replacing many of the logical functions and digital equipment which they know so well. This group needs to acquire an easy familiarity with the general computer scene (and its jargon), but usually worries most about programmiing aspects, and program/hardware linkages.

The third class is undergraduates and immediate post-graduates who come across LSI and microcomputers without any previous history to help or confuse. In general they don't want historical parallels—they can adapt naturally to the new devices provided that the many practical points are simply explained.

Although microcomputers have important uses for both electrical engineers and computer engineers the early applications were heavily biased towards simple controllers and other devices which are designed by electrical engineers. This book reflects the current situation, and spends only a little time on microprogramming, and none at all dealing with the slice-type or chip-set microcomputers, which have considerable significance in computer science. Having said this however, the volume is probably the best book available which compresses the new approach into a manageable number of pages and says something useful about every aspect of starting a microcomputer applications set-up. It should appeal to the three classes of reader described earlier.

After starting with a brief summary of the usual material about LSI production economics, there is a short, unusual and welcome chapter on the economics of building digital equipment. Subheadings are always no-nonsense, e.g. 'Where does all the money go?', 'Avoiding bad components'. After a treatment of logic design in the MSI/LSI era, the book describes printed circuit board micros and single chip micros using the IMP-16 and 8080 as examples.

Instruction sets, assembly language and high level language are all dealt with quickly, but well enough to get new users started, and there is a short section on microprogramming. Problems of interconnections and electrical transient reflections are well covered, as is the connection of various types of peripheral device. In several ways this book makes a useful companion for *Design of Digital Systems* by John Peatman (McGraw-Hill).

The last chapter is perhaps the most surprising, dealing with the social significance of the devices made by digital engineers. The author is interested in the difference between genuinely useful technology and mere gadget-peddling.

Altogether an interesting and stimulating book for most workers in the field, and one that can be recommended for all University, Polytechnic and Industrial Libraries. A companion volume on slice-type micros in about two years would be equally welcome.

F. G. HEATH (Edinburgh)

Biological Identification with Computers edited by R. J. Pankhurst, 1975; 333 pages. (*Academic Press*, £11·00).

Plants and animals have observable characters (e.g. size, colour, biochemical reactions). Using these, they can be divided into classes or 'taxa', e.g. species, which can be either separated by sharp divisions or grade into one another. 'Identification' means the assignment of a given individual to an appropriate class. Problems such as the suitable choice of characters leading to rapid or economical identification, calculation of the probability that an assignment is correct, or use of automated data input, are all suitable for computerisation. This book is the printed version of a 1973 symposium on this subject, unfortunately rather overloaded with technical terms. But it contains a useful glossary and bibliography.

A. B. SMITH (London)