PART IV

Filters and Oscillators

CHAPTER 16
Filters and Tuned Amplifiers 1254

CHAPTER 17
Signal Generators and Waveform-Shaping Circuits 1334

In Part IV we study an important class of analog circuits: filters and oscillators. Both topics have in common an application or system orientation. They provide dramatic and powerful illustration of the application of both negative and positive feedback. While the filters studied here are linear circuits, the design of oscillators makes use of both linear and nonlinear techniques.

Chapter 16 deals with the design of filters, which are important building blocks of communication and instrumentation systems. Filter design is one of the rare areas of engineering for which a complete design theory exists, starting from specification and culminating in an actual working circuit. The material presented should allow the reader to perform such a complete design process.

In the design of electronic systems, the need usually arises for signals of various waveforms—sinusoidal, pulse, square-wave, and so on. The generation of such signals is the subject of Chapter 17. It will be seen that some of the circuits utilized in waveform generation employ an op-amp version of the basic memory element studied in Chapter 15, the bistable multivibrator or latch.

The study of filters and oscillators relies on a thorough familiarity with basic feedback concepts including the effect of feedback on the amplifier poles (Chapter 10), and with op-amp circuit applications (Chapter 2). As well, we assume knowledge of basic *s*-plane concepts including transfer functions, poles, zeros, and Bode plots.