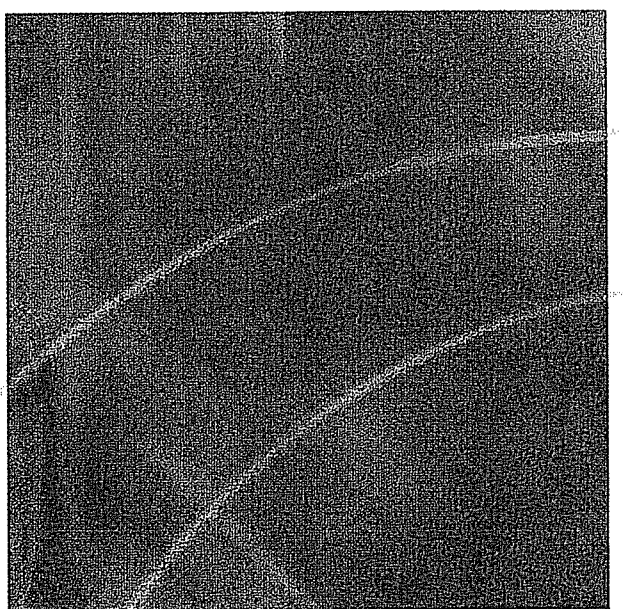
EXHIBIT 10

Signals and Systems



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Signals and Systems

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average stock index) are whole numbers and so likewise discrete. In this case both the independent and the dependent variables are discrete.

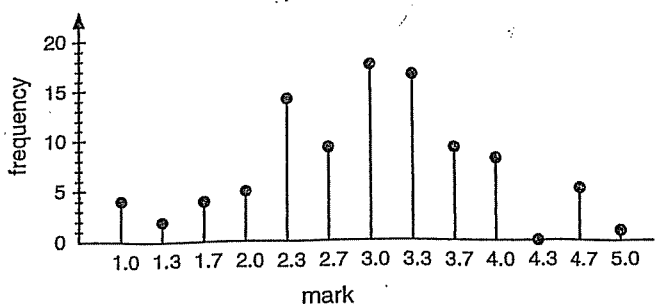

Figure 1.4: Frequency of earned marks for a test in systems theory

The signals we have considered thus far have been quantities that depend on a *single* independent variable. However, there are quantities with dependencies on two or more variables. The greyscales of Figure 1.5 depend on both the x and the y co-ordinates. Here both axes represent independent variables. The dependent variable $s(x, y)$ is entered along one axis, but is a greyscale value between the extreme values black and white.

When we add motion to pictures, we have a dependency on three independent variables (Figure 1.6): two co-ordinates and time. We call these two- or three-dimensional (or generally multidimensional) signals. When greyscale values change continuously over space or over space and time, these are continuous signals.

All our examples have shown parameters (voltage, temperature, stock index, frequencies, greyscale) that change in relation to values of the independent variables. Thereby they transmit certain information. In this book we define a signal as follows:

Definition 1: Signal

A signal *is a function or sequence of values that represents information.*

The preceding examples have shown that signals can assume different forms. Signals can be classified according to various criteria, the most important of which are summarised in Table 1.1.