**Explanation of Analog-to-Digital Conversion**

Analog-to-digital conversion involves transforming a continuous analog signal into a discrete digital format through sampling and quantization.

Sampling is the process of measuring the analog signal at regular intervals. For instance, with a sampling time of 0.25 seconds, the analog signal is sampled four times per second, resulting in a high sampling frequency. This captures more details of the signal compared to a sampling time of 1 second, which only samples once per second.

Quantization maps the sampled values to a finite number of discrete levels. A 3-bit encoder, offering 8 levels, provides a finer representation of the signal compared to a 2-bit encoder, which has only 4 levels. Higher resolution encoders reduce quantization error but require more complex processing.

**Effects of Sampling and Quantization:**

Higher Sampling Rate: Results in a more accurate digital signal by capturing more signal details.

Higher Bit Resolution: Reduces quantization error and provides a more precise representation.

In conclusion, higher sampling rates and encoder resolutions yield more accurate digital representations but at the cost of increased complexity. Balancing these factors is crucial for designing effective ADC systems.