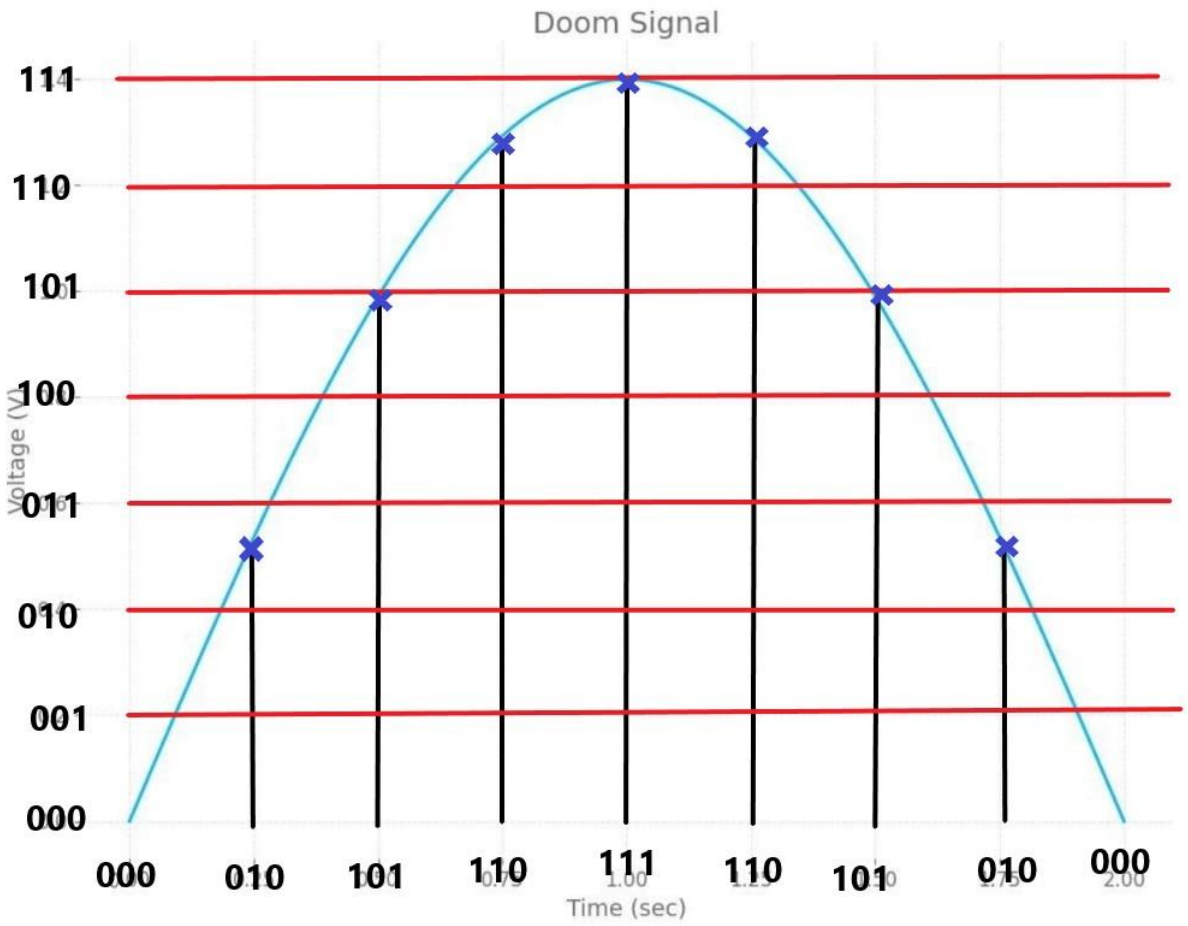
Hint:

- Red lines indicate sampling.

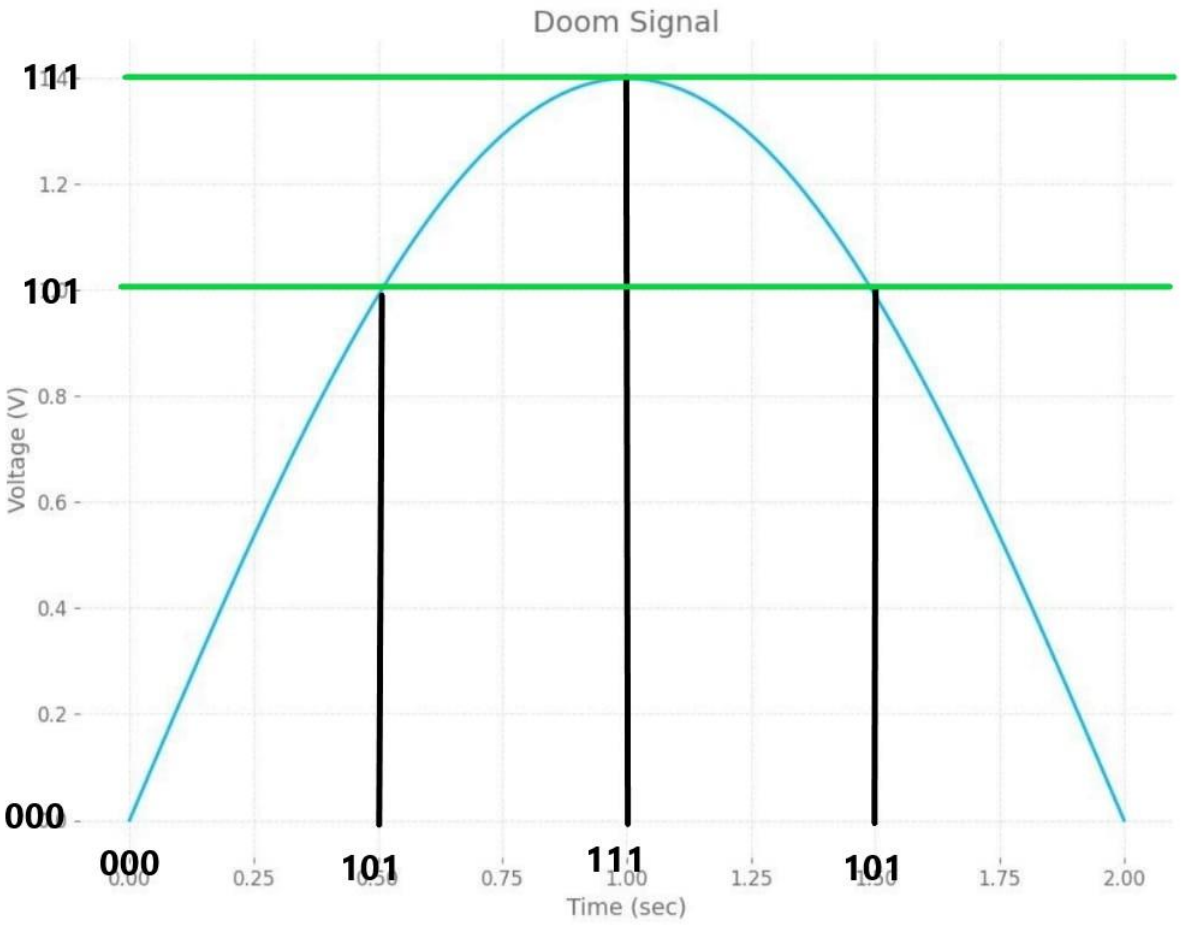
- Green lines and black points indicate quantizing.

- Binary codes on the x-axis and y-axis represent coding.

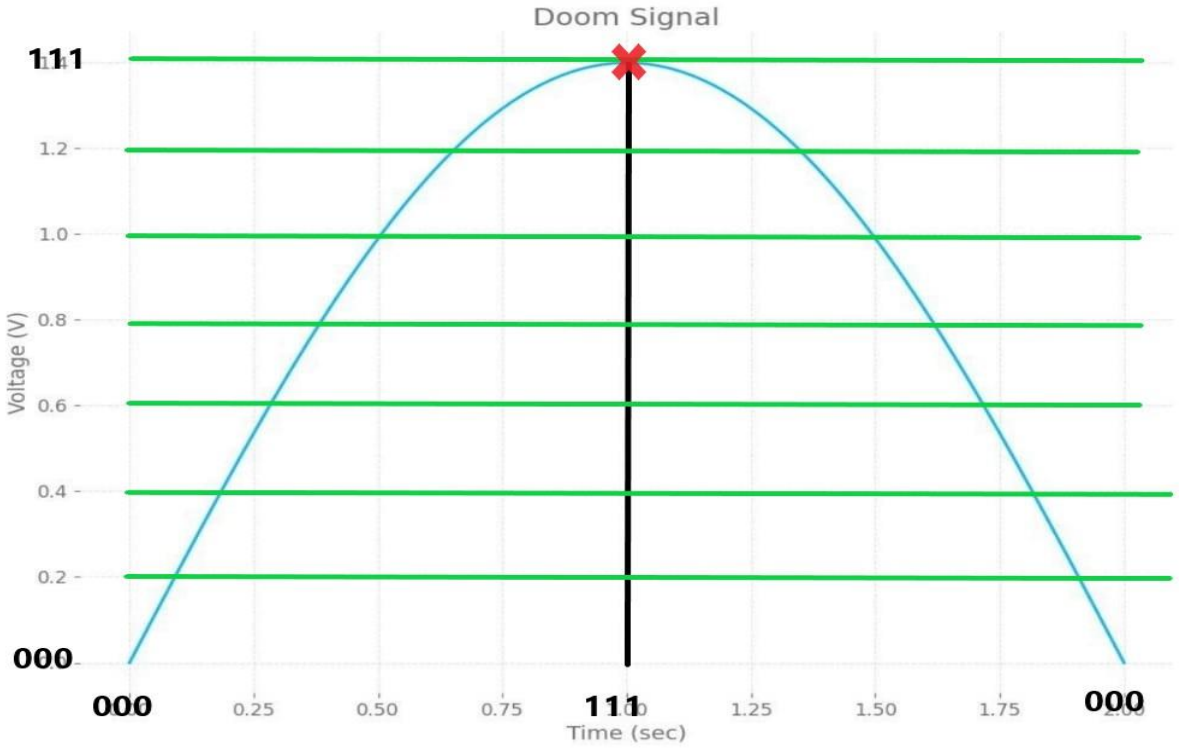
3-bit encoder with Sampling Time = 0.25sec



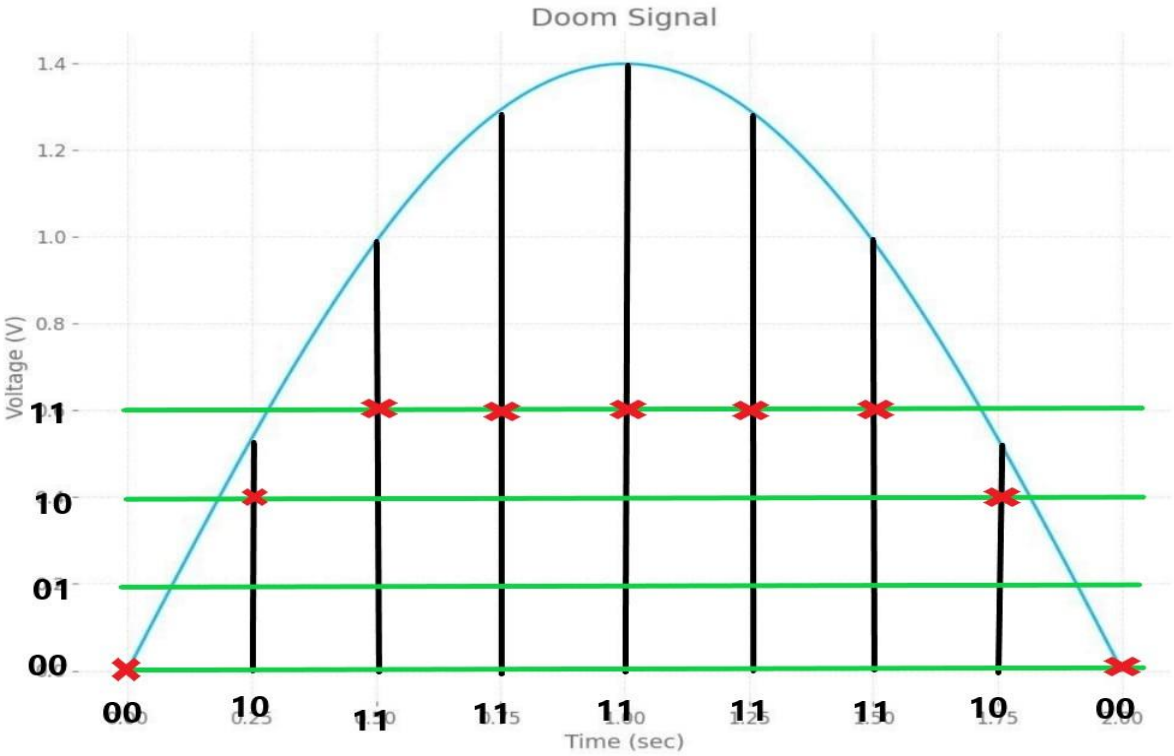
3-bit encoder with Sampling Time = 0.5sec



3-bit encoder with Sampling Time = 1sec



2-bit encoder with Sampling Time = 0.25sec



Conclusion:

- **Impact of Sampling Time:**

• **Shorter Sampling Time (0.25 sec)**: Results in more samples being taken within the same time period. This means a higher temporal resolution and a more accurate representation of the signal's variations over time.

• **Longer Sampling Time (0.5 sec, 1 sec)**: Results in fewer samples within the same time period. This leads to a lower temporal resolution, potentially missing some of the finer details of the signal's variations.

- **Impact of Bit Resolution:**

• **Higher Bit Resolution (3-bit encoder)**: Allows for more quantization levels, resulting in a more precise representation of the signal's amplitude. This reduces the quantization error and provides a closer approximation to the original analog signal.

• **Lower Bit Resolution (2-bit encoder):** Reduces the number of quantization levels, increasing the quantization error. This results in a less accurate representation of the signal's amplitude, which can lead to more noticeable distortion.

- **Combination of Sampling Time and Bit Resolution:**

• 3-bit Encoder with 0.25 sec Sampling Time: Provides the best combination of temporal and amplitude resolution among the given options, yielding the most accurate digital representation of the analog signal.

• **3-bit Encoder with 0.5 sec and 1 sec Sampling Time:** While still maintaining good amplitude resolution, the temporal resolution decreases, potentially missing some signal details.

• **2-bit Encoder with 0.25 sec Sampling Time:** Maintains good temporal resolution but suffers from increased quantization error due to the lower bit resolution, leading to less accurate amplitude representation.