The following table depicts a sampled analog signal for digital signal representation. By applying the concept of Pulse Code Modulation, assume there will be 3-bit code words for each sampled amplitude. **Show** the normalized quantized value and quantization code for the given analog signal value at different time stamps. Assume that the sampling amplitudes are between -40V to +40V.

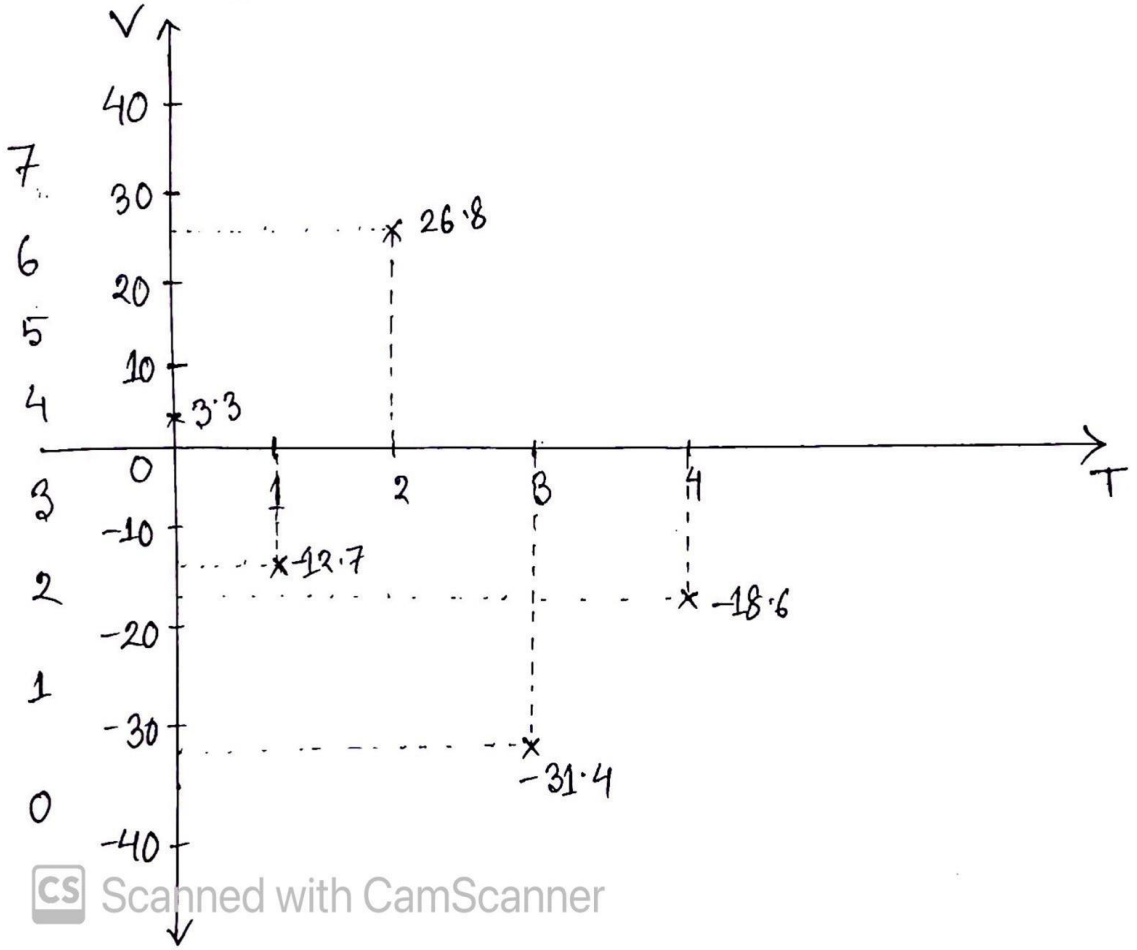
Time	Analog Signal Value (V)
0	3.3
1	-12.7
2	26.8
3	-31.4
4	-18.6

Number of bits = $\log_2 L$

$\Rightarrow 3 = \log_2 L$

$\Rightarrow L = 2^3 = 8$

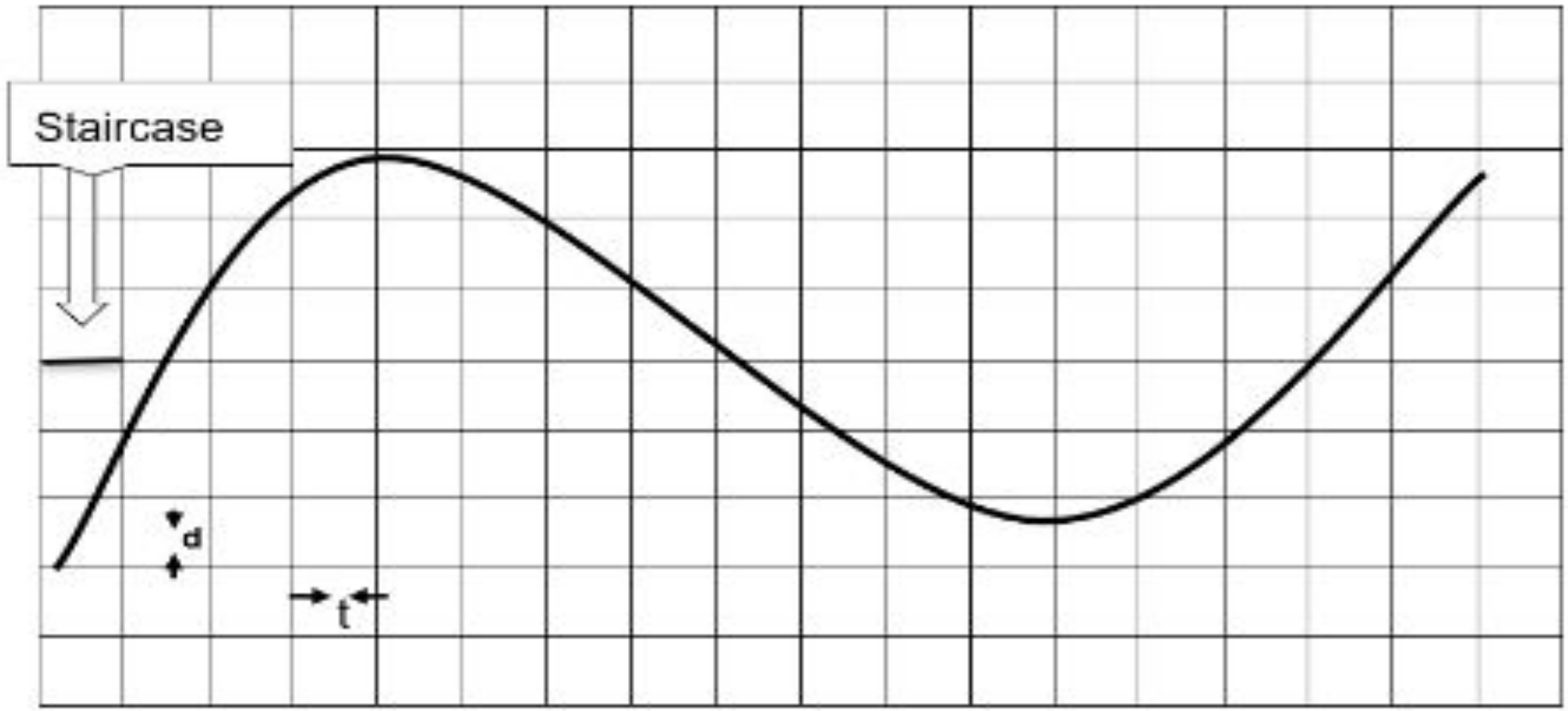
$\Delta = \frac{40-(-40)}{8} = \frac{80}{8} = 10$



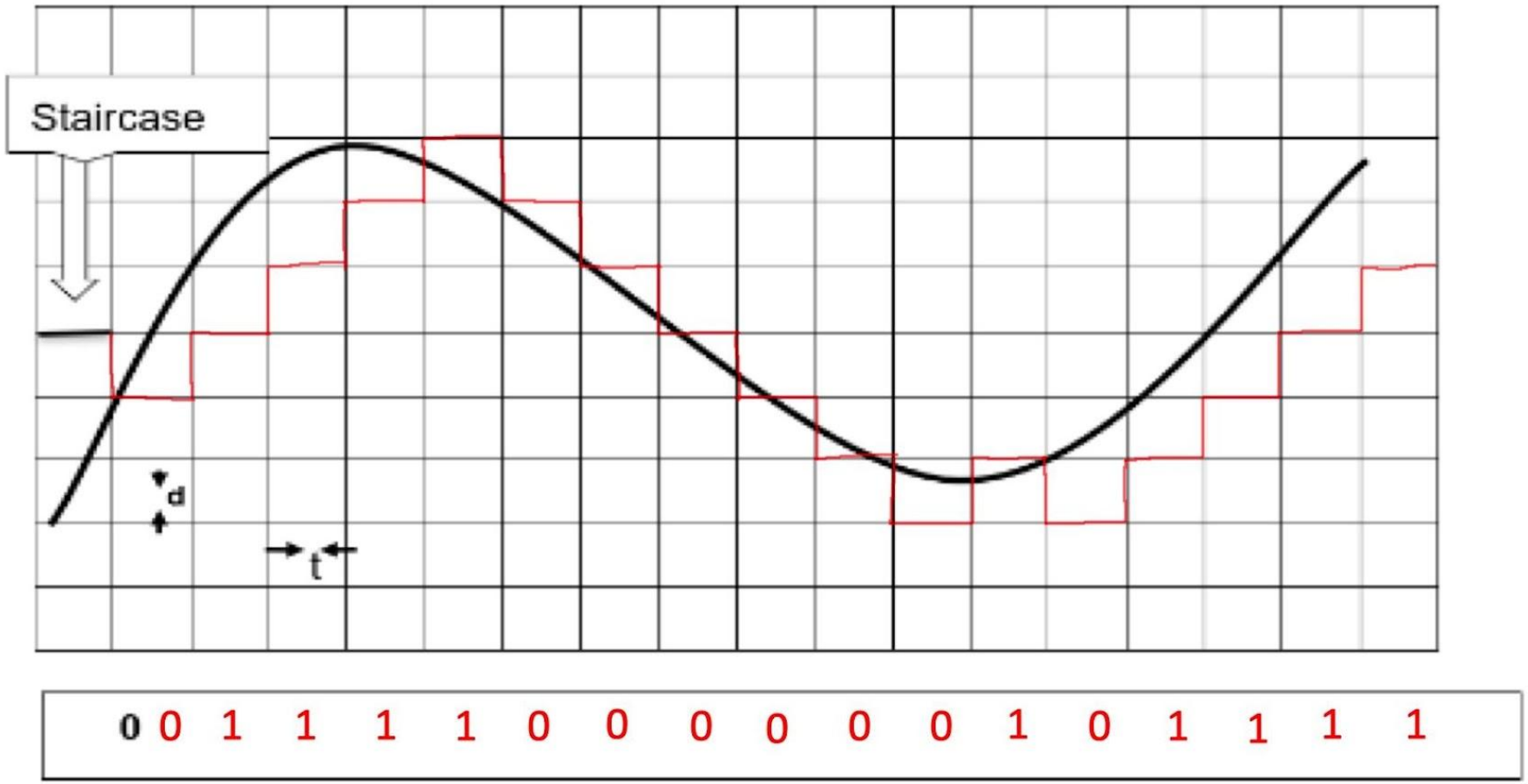
Normalized Quantized Value = $\frac{\text{Midpoint}}{\text{Zone width}}$

Analog signal value(r)	Midpoint	Normalized Quantized value	Quantization Code
3·3	$\frac{0+10}{2} = 5$	$\frac{5}{10} = 0.5$	4
-12·7	$\frac{-10+(-20)}{2} = -15$	$\frac{-15}{10} = -1.5$	2
26·8	$\frac{20+30}{2} = 25$	$\frac{25}{10} = 2.5$	6
-31·4	$\frac{-30+(-40)}{2} = -35$	$\frac{-35}{10} = -3.5$	0
-18·6	$\frac{-10+(-20)}{2} = -15$	$\frac{-15}{10} = -1.5$	2

Show the staircase in the following graph and generate the digital data from the given analog signal using the Delta Modulation (DM) technique. Answer this question in the question paper itself. You don't have to answer this question in the answer script.



0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