

A decorative graphic on the left side of the slide, consisting of a network of white lines and circles on a blue background, resembling a circuit board or a tree structure.

04. ANALOG AND DIGITAL SIGNAL

M3U1P4



WHAT IS A SIGNAL?

SIGNAL

- A signal is an electromagnetic or electrical current that is used for carrying data from one system or network to another
- In electronics and telecommunications, it refers to an electromagnetic wave which carries information
- We have two types of signals:
 - Analog
 - Digital

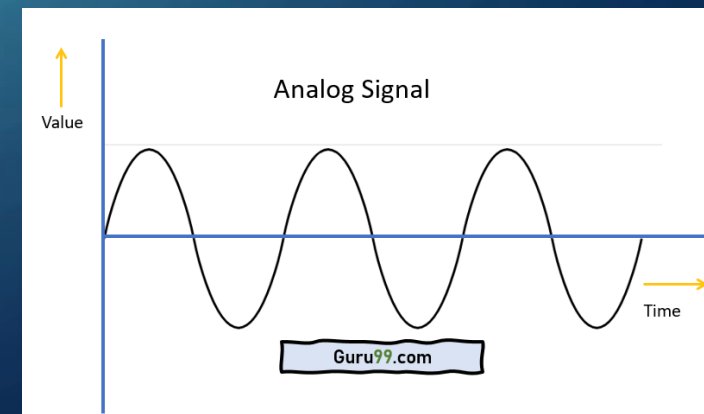
The background is a dark blue gradient. In the corners, there are white line-art patterns resembling circuit boards or signal traces. These patterns consist of straight lines of varying lengths and angles, ending in small circles, which represent components or connection points on a board. The patterns are most prominent in the top-left, bottom-left, and bottom-right corners, with a smaller one in the top-right.

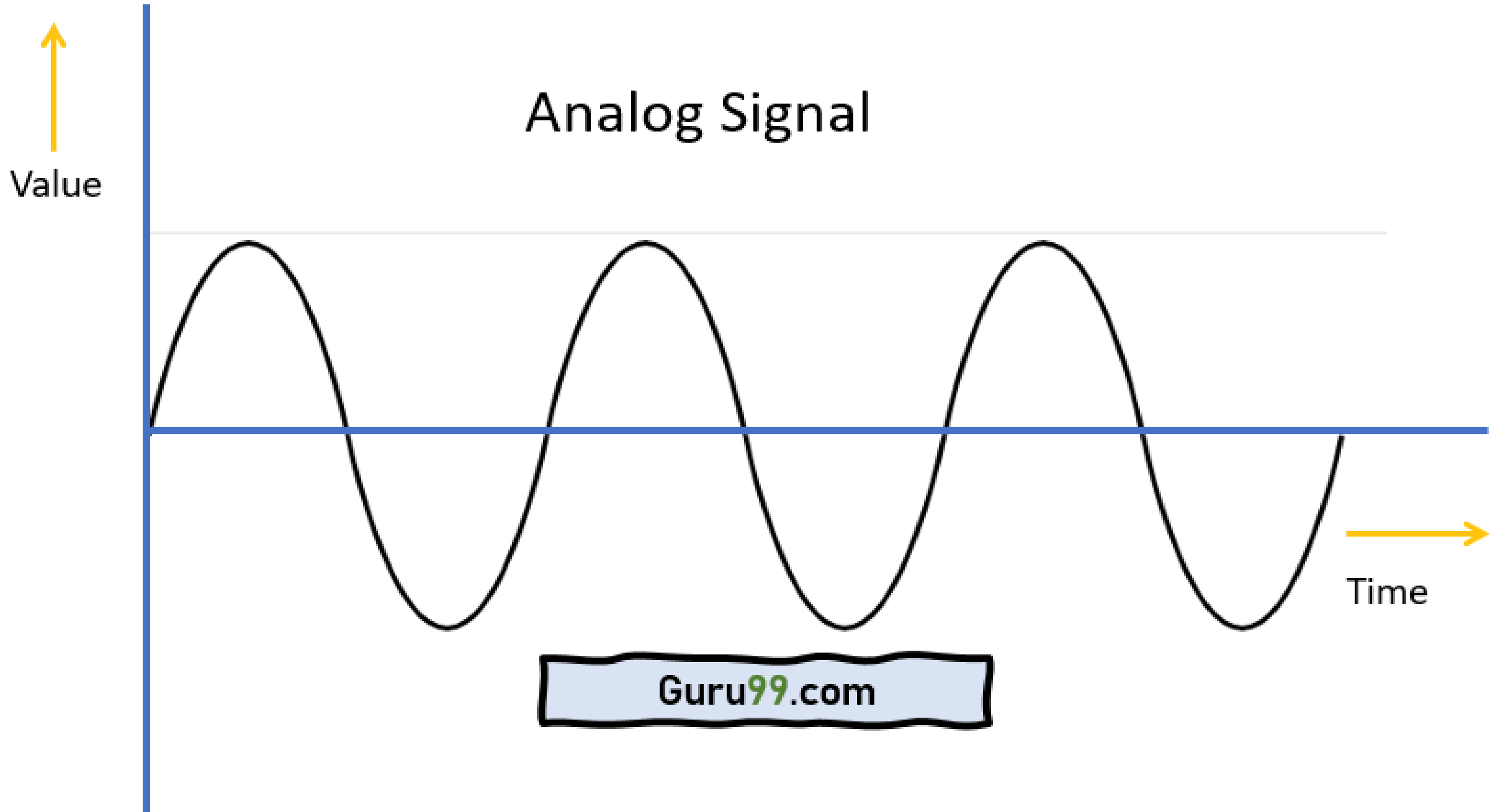
ANALOG SIGNAL

ANALOG SIGNAL

- An analog signal is a continuous time-varying value represents another time-based variable

- สัญญาณแอนะล็อก (Analog Signal) เป็นสัญญาณแบบต่อเนื่อง มีลักษณะเป็นคลื่นไซน์ (sine wave) โดยที่แต่ละคลื่นจะมีความถี่และความเข้มของสัญญาณที่ต่างกัน เมื่อนำสัญญาณข้อมูลเหล่านี้ผ่านอุปกรณ์รับสัญญาณและแปลงสัญญาณ ก็จะได้ข้อมูลที่ต้องการ ตัวอย่างของการส่งข้อมูลที่มีสัญญาณแบบแอนะล็อก คือ การส่งผ่านระบบโทรศัพท์เคลื่อนที่

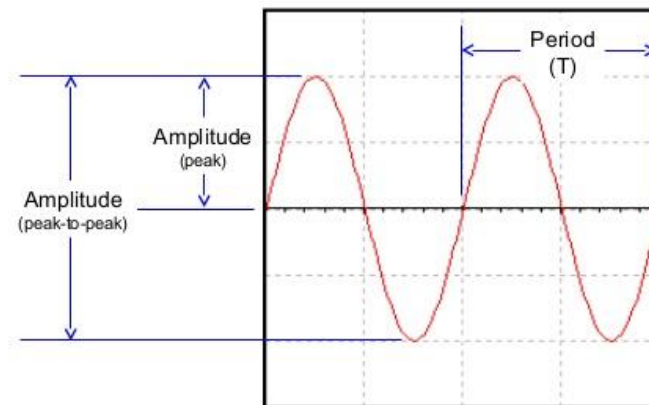




ANALOG SIGNAL

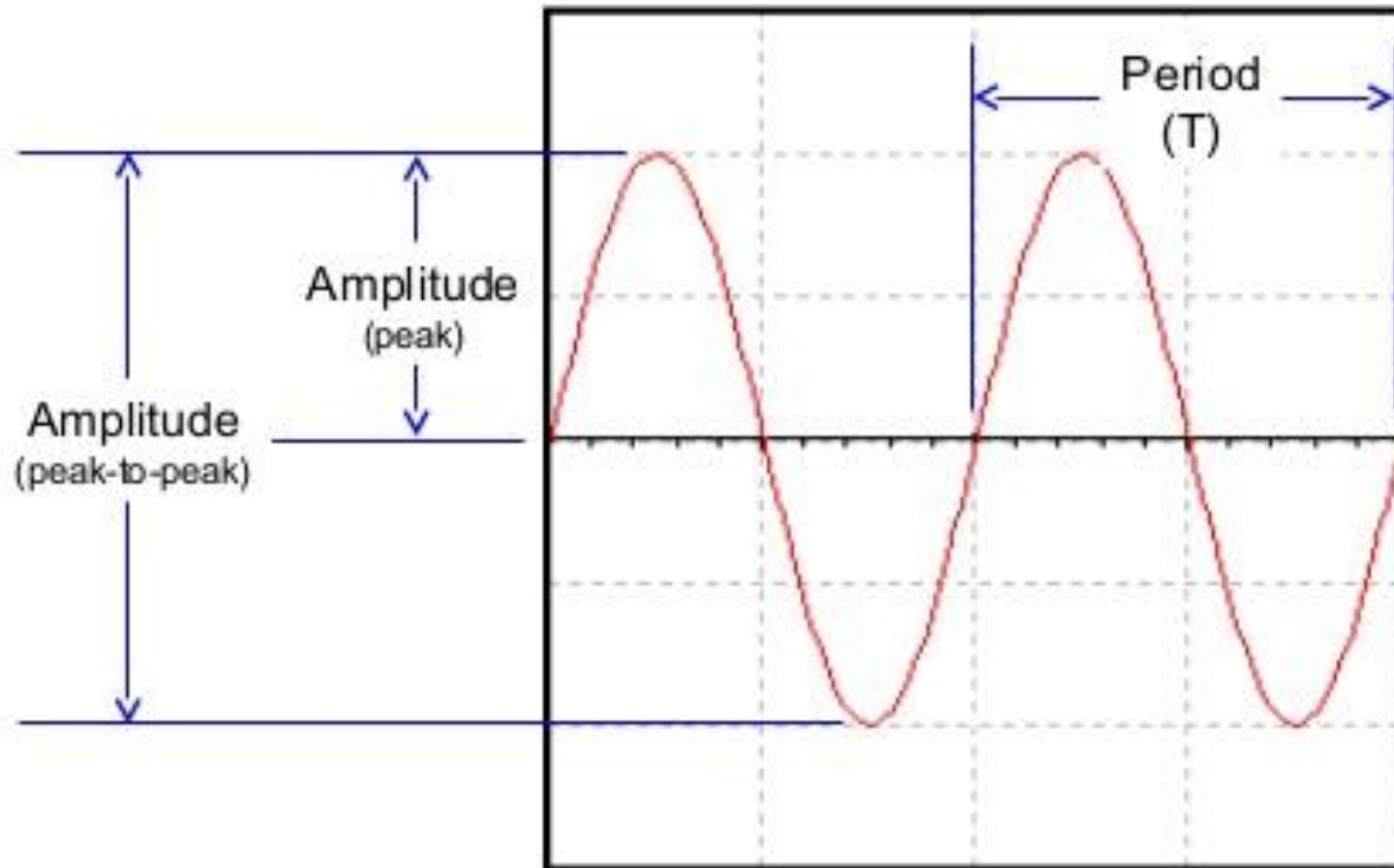
- An analog signal is defined by 3 values
 - Amplitude (A) – highest level (peak)
 - Period (T) – time that it takes to make a full cycle
 - Frequency (F) – How many periods per 1 sec

Parts of an Analog Signal



Frequency:
$$F = \frac{1}{T} \text{ Hz}$$

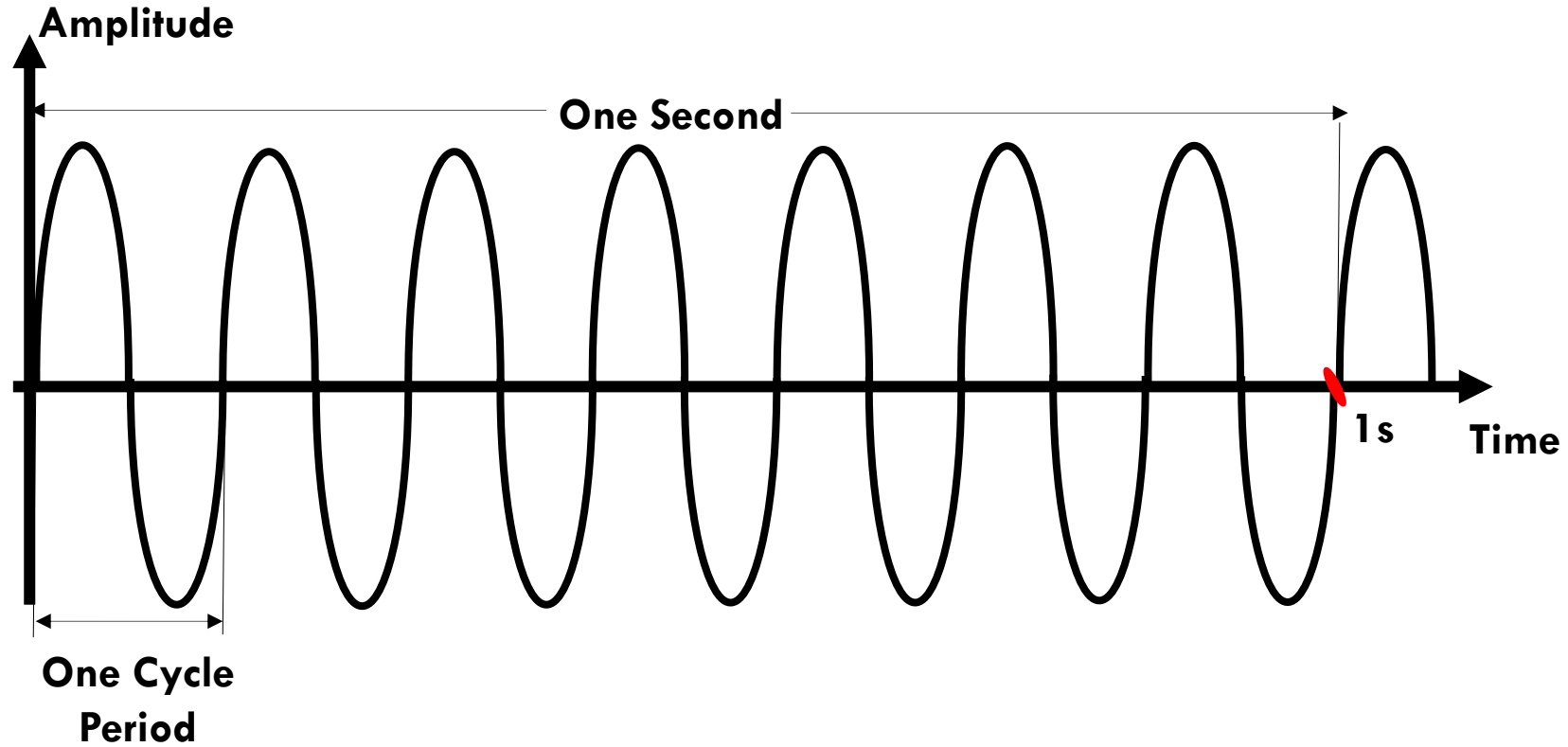
Parts of an Analog Signal



Frequency:

$$F = \frac{1}{T} \text{ Hz}$$

Seven Periods in one Second → Frequency = 7Hz



$$T = \frac{1}{F} = \frac{1}{7} = 0.143 \text{ s}$$

$$\text{Frequency} \rightarrow F = \frac{1}{T} \text{ [Hz]}$$

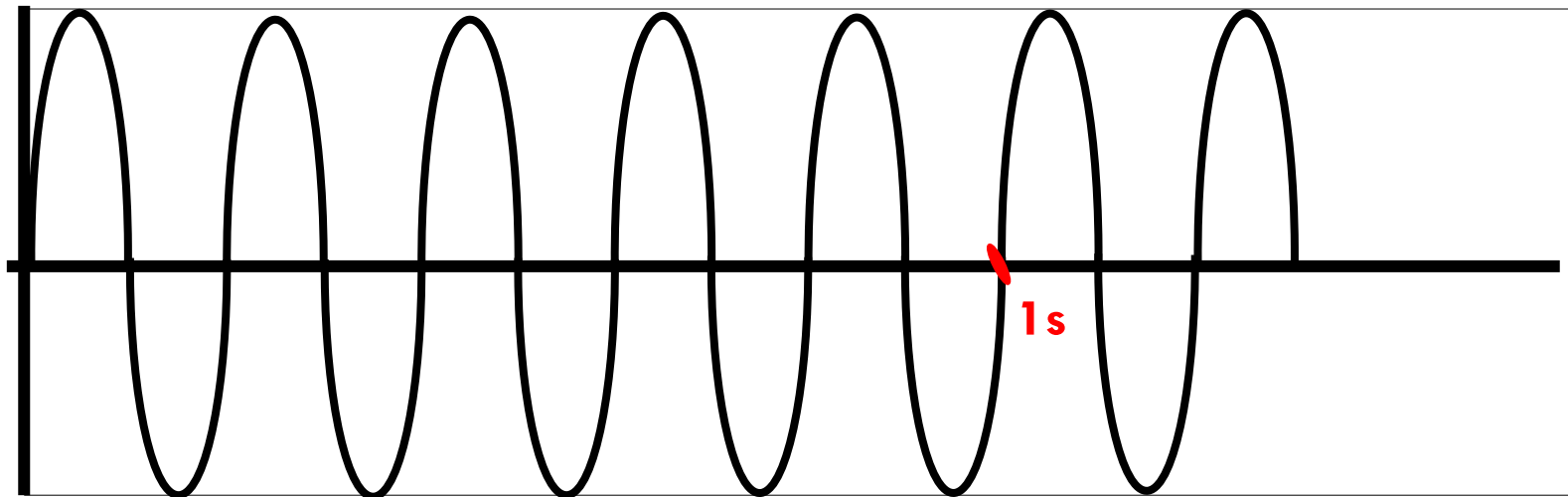
$$\text{Period} \rightarrow T = \frac{1}{F} \text{ [s]}$$

The background is a dark blue gradient. In the corners, there are white line-art illustrations of circuit boards or neural networks, consisting of lines and small circles.

CLASSWORK

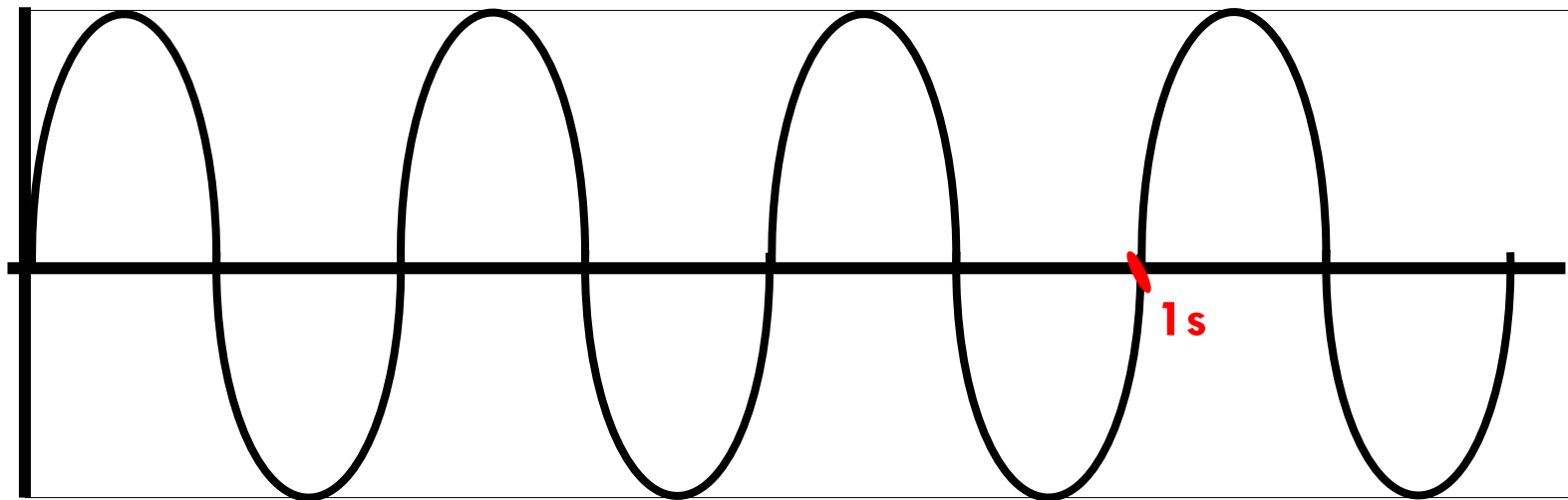
1. ANALOG SIGNAL

- Look at this signal
- What is the frequency of this signal?



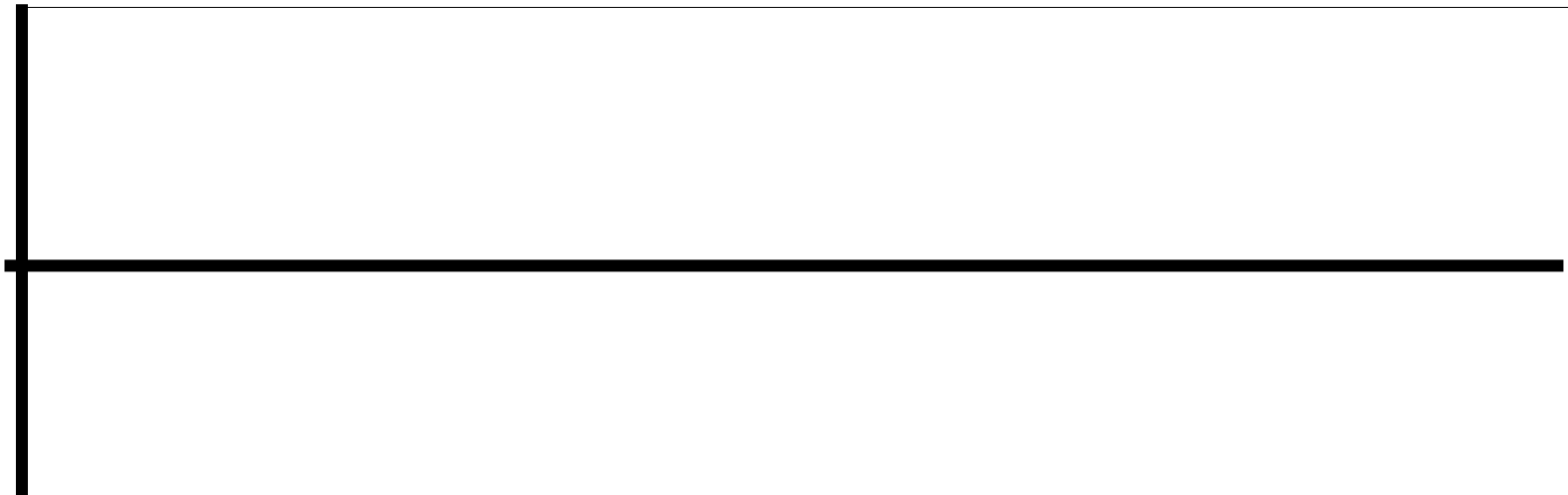
2. ANALOG SIGNAL

- Look at this signal
- What is the period(T) of this signal?



3.ANALOG SIGNAL

- Draw a signal with a frequency of 10Hz.



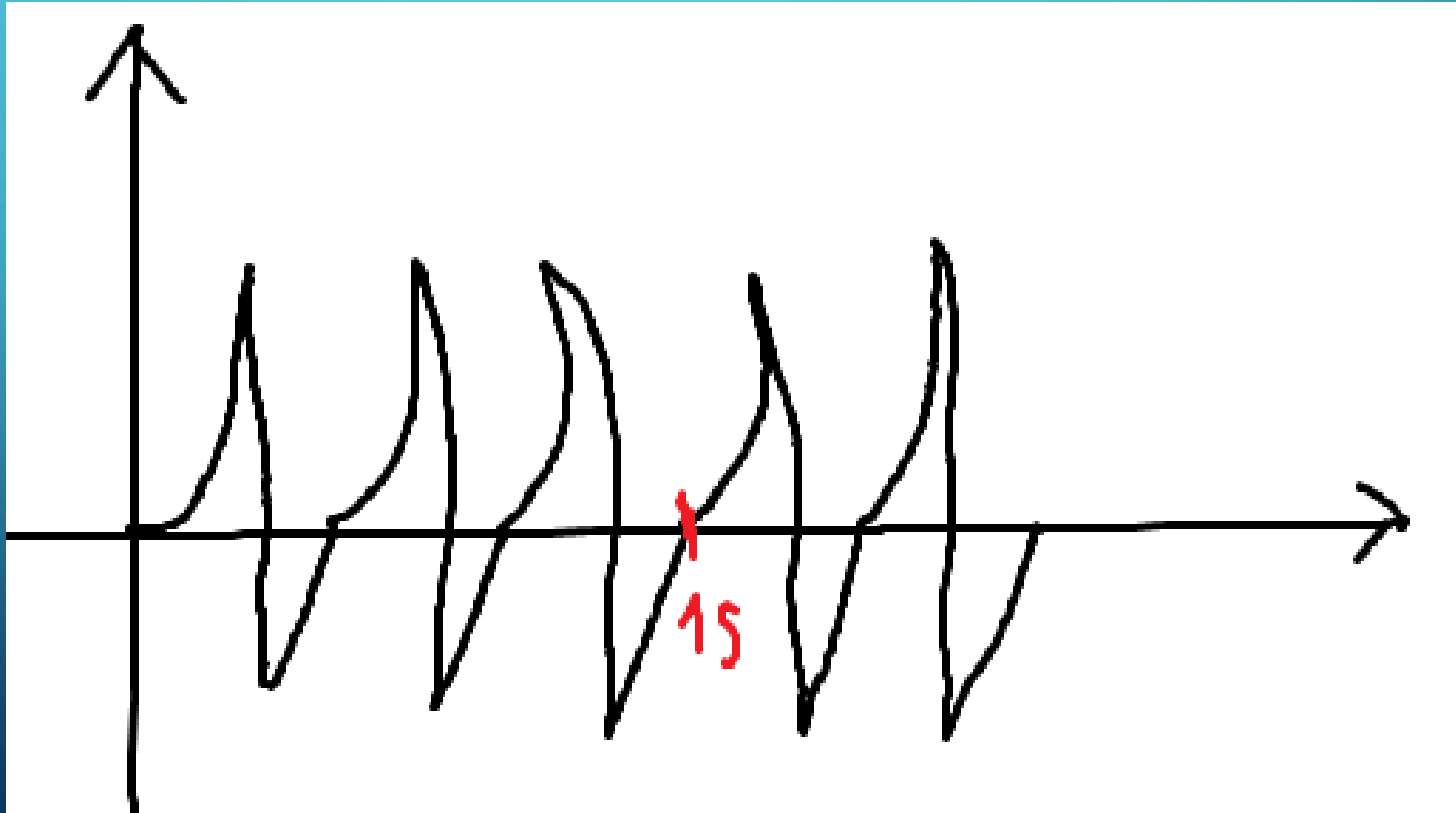
4. ANALOG SIGNAL

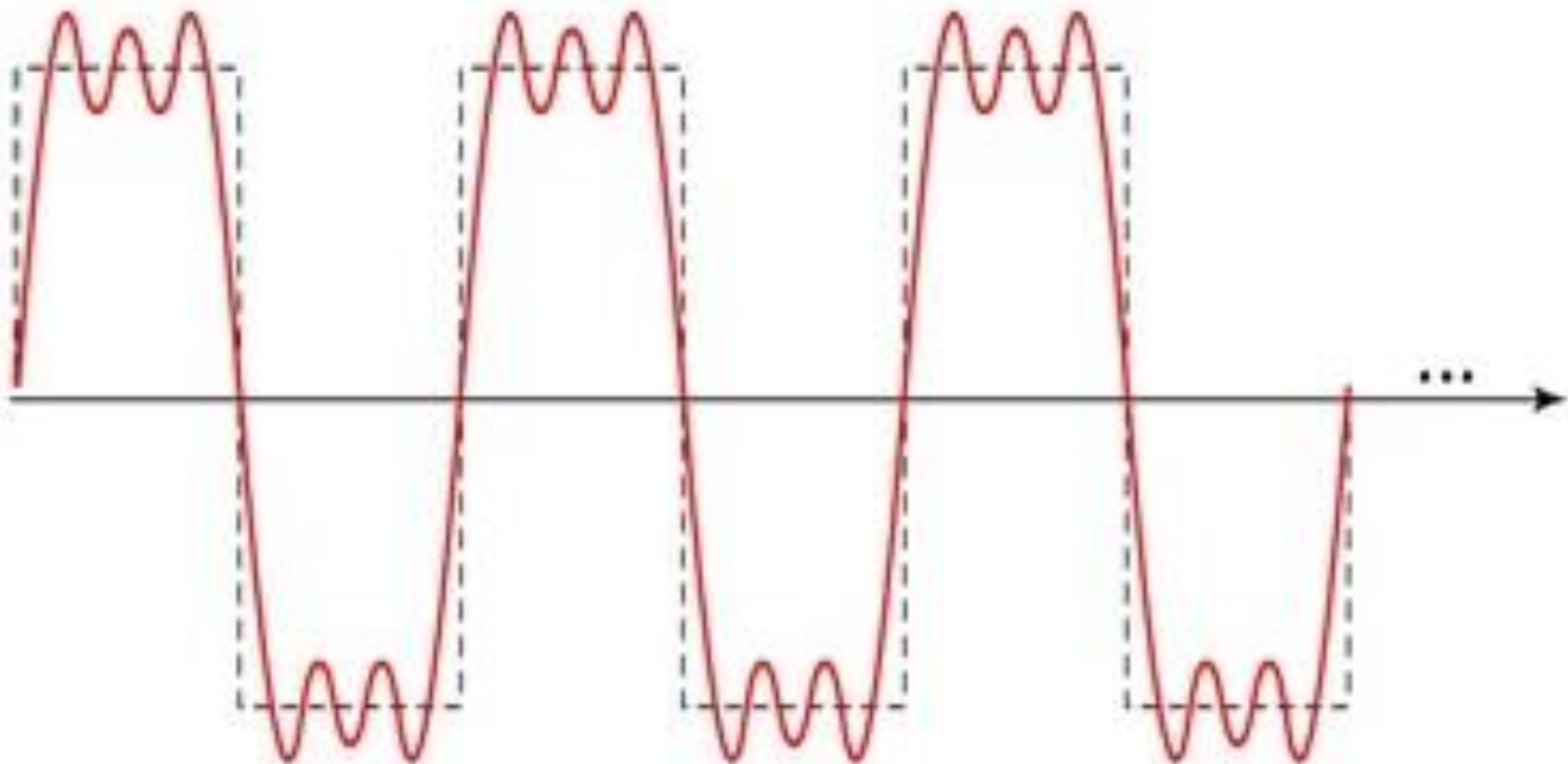
- Draw a signal with a period of 0.333s.



5. ANALOG SIGNAL

- What is the frequency of this signal?



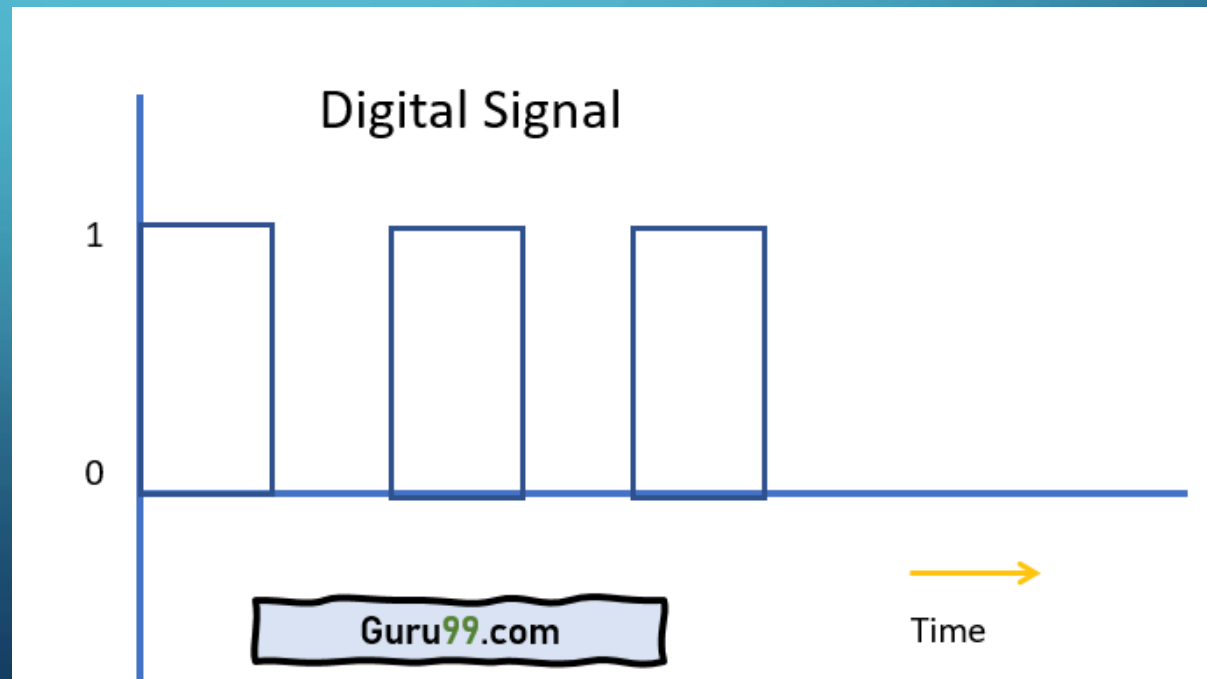


The background is a dark blue gradient. In the corners, there are white line-art illustrations of circuit traces and nodes. The top-left and bottom-left corners feature more complex, branching circuit patterns, while the top-right and bottom-right corners have simpler, more linear traces.

DIGITAL SIGNAL

DIGITAL SIGNAL

- A digital signal is a signal that is used to represent data as a sequence of separate values at any point in time. It can only take on one of a fixed number of values. This type of signal represents a real number within a constant range of values.



Digital Signal

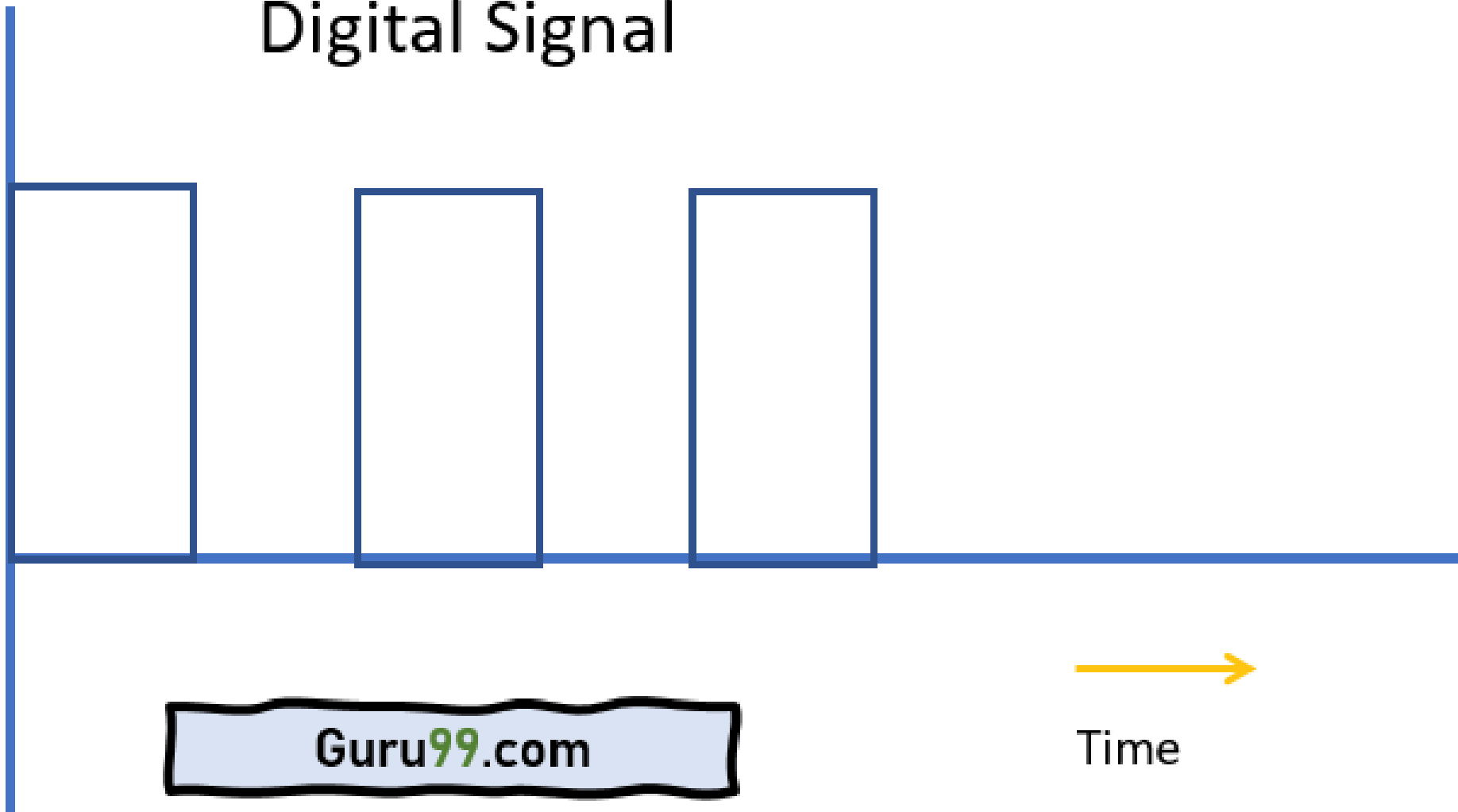
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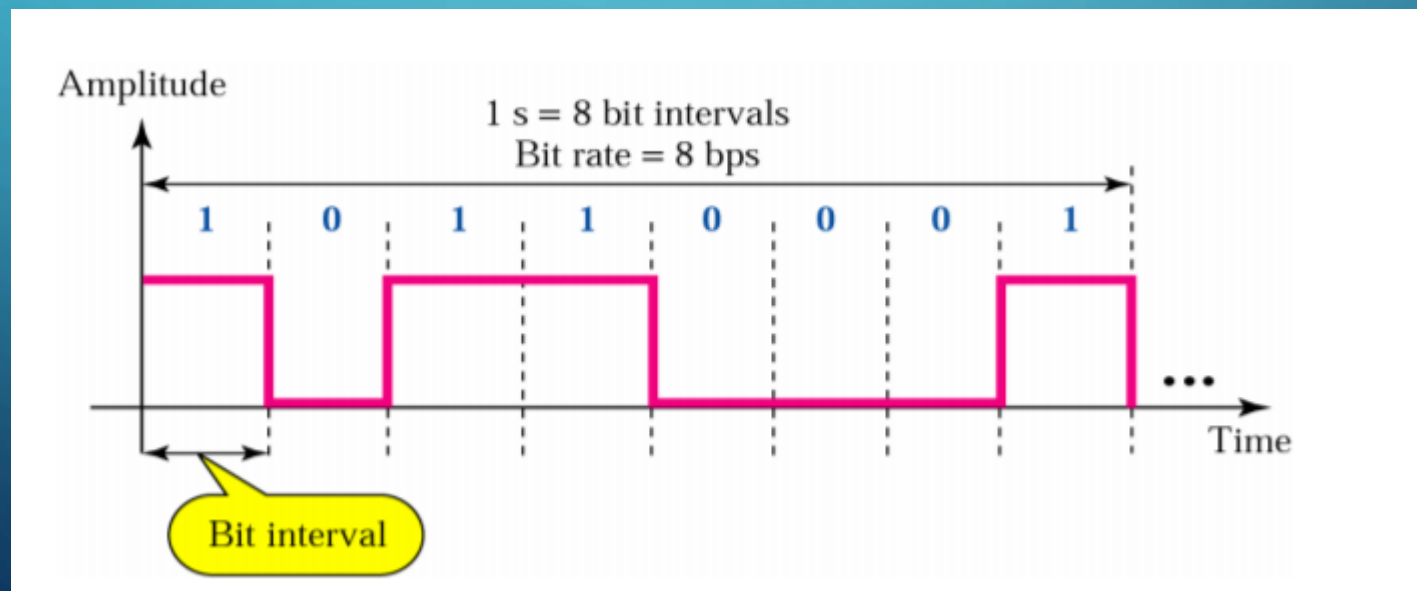


Time



PARTS OF DIGITAL SIGNAL

- A digital signal is defined by 3 values
 - Amplitude (A) – highest level (peak)
 - Bit interval [sec]– time that it takes to send one bit
 - Bit rate [bps]– How many bits are send per one second



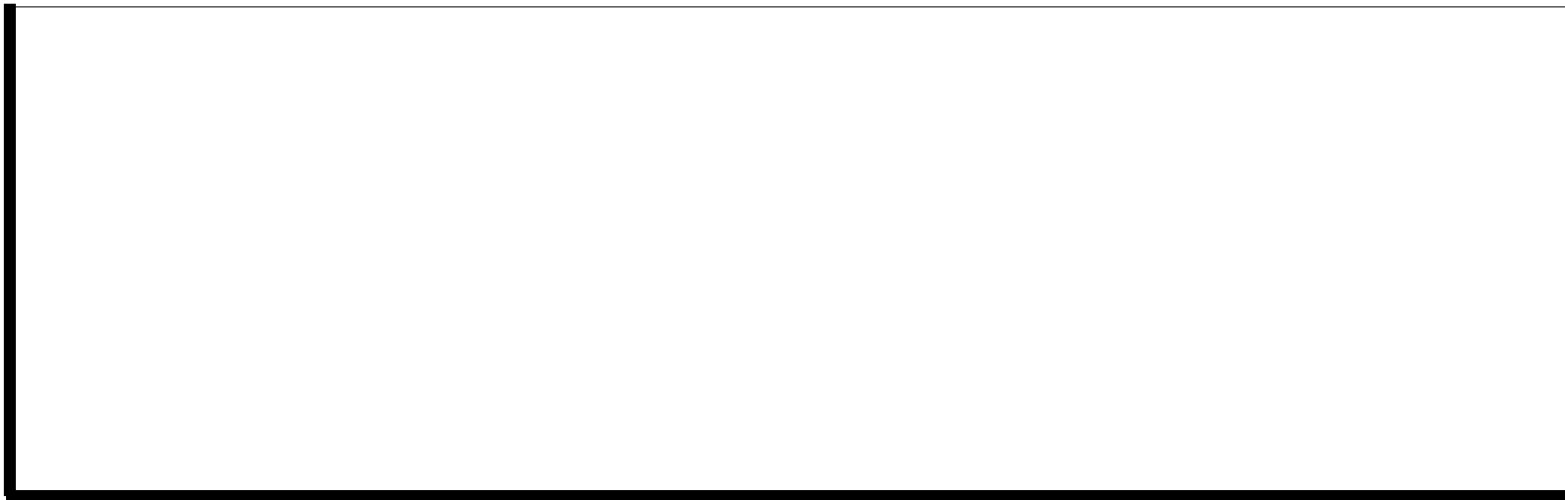


CLASSWORK

1. DIGITAL SIGNAL

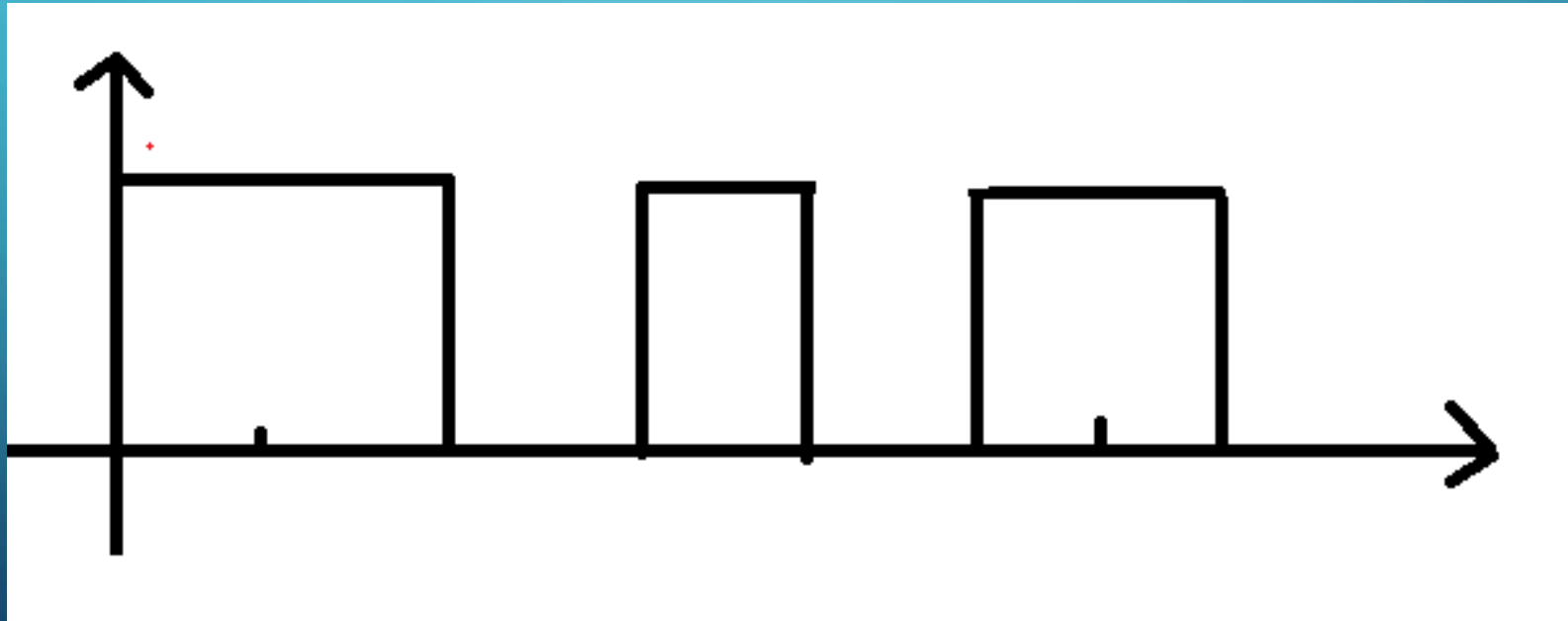
- Draw a signal with a bitrate of 4bps using this bit information

1 0 1 1 0 1 0 0 1 0



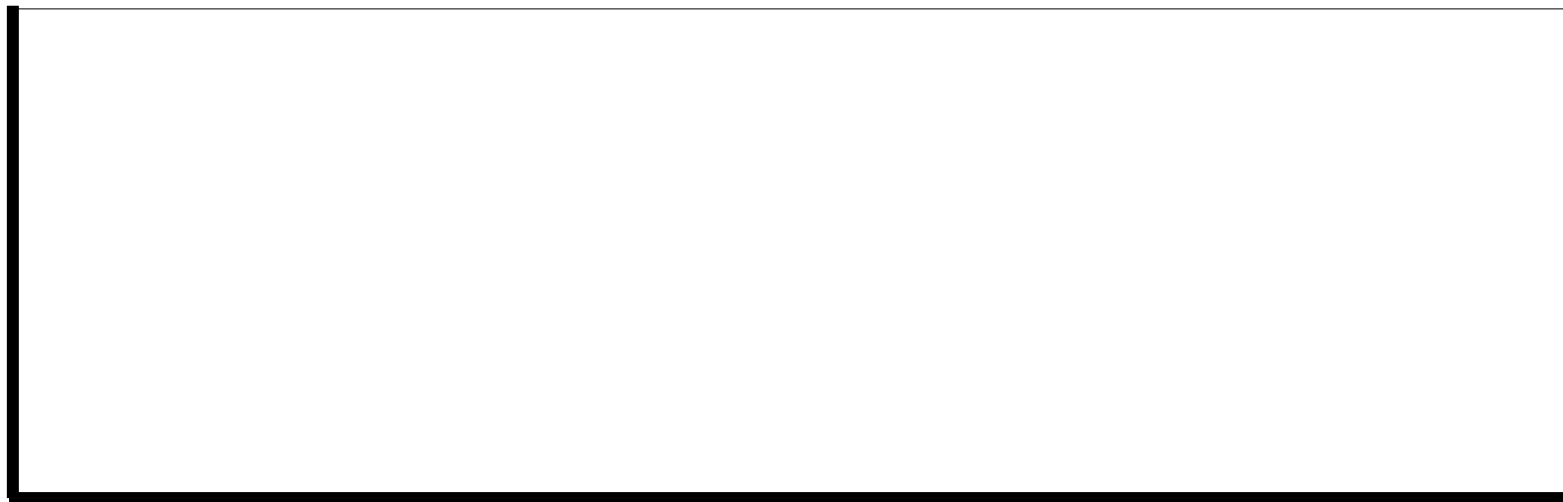
2. DIGITAL SIGNAL

- What information are we sending in this signal?



3. DIGITAL SIGNAL

- Draw a digital signal that has a bit interval of 0.2 sec
- Bit information is: 1 0 1 1 1 0 1 0 1 1





ANY QUESTIONS?



WORKSHEET



THE END