INFORMATION SHEET – DIGITAL

1. Operational amplifier

1.1 Gain:

$$Av = \frac{V_{out}}{V_{in}} \qquad Av = -\left(\frac{Rf}{R_{in}}\right) \qquad Av = \left(1 + \frac{Rf}{R_{in}}\right)$$

1.2 Voltage:

$$V_{out} = V_{in} \times \left(1 + \frac{Rf}{R_{in}}\right) \qquad V_{out} = V_{in} \times \left(-\frac{Rf}{R_{in}}\right) \qquad V_{out} = -\left(V_i - V_x\right)Av$$

$$V_{out} = -\left(V_1 + V_2 + V_3\right) \qquad V_{out} = -V_i \times Av \qquad Vref = Vcc\left(\frac{R1}{R1 + R2}\right)$$

$$Vo = -Vi\left(\frac{1}{j2\pi fRC}\right) \qquad Vo = -R_fC\left(\frac{\Delta V_i}{\Delta t}\right) \qquad V_{out} = -\left(V_{i1}\frac{Rf}{R_1} + V_{i2}\frac{Rf}{R_2} + V_{i3}\frac{Rf}{R_3}....\right)$$

1.3 Time:

$$T_1 = 0{,}693\left(R_2 + R_1\right)C \qquad T = RC \qquad T = R_fC$$

$$T_1 = 0{,}693 \times R_2C \qquad T = 0{,}693RC \qquad T = 1{,}1R_2C$$

1.4 Frequency:

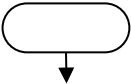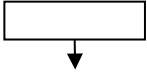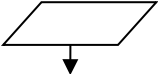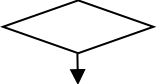$$f = \frac{1}{2R_fC} \qquad f = \frac{1{,}44}{\left(R_1 + 2R_2\right)C}$$

1.5 Duty cycle:

$$\text{Duty cycle} = \frac{R_1 + R_2}{\left(R_1 + 2R_2\right)} \times 100\%$$

2. Logic

$$MOD\ X = 2^N \qquad \text{Counting steps} = 2^N - 1 \qquad N = \sqrt{MOD\ X}$$

3.   **Flow chart symbols**

Simbole	Name
	Start/End
	Process
	Input/Output
	Decision
	Arrows