

# CHAPTER 1 INTRODUCTORY CONCEPTS

---

## 1.1 Objectives

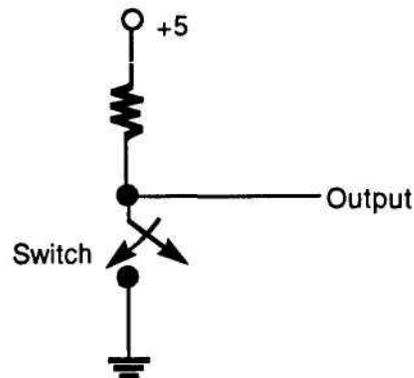
After completing this chapter the student should be able to:

- Distinguish between digital and analog signals
- Discuss the use of Is and Os to represent quantity or condition
- Represent binary quantities
- Explain operation of a simple digital circuit

# 1.1 Questions and Answers

1. Explain the difference between digital and analog signals.  
**Answer:** Analog signals are continuous. Digital signals have discrete logic levels or states.
2. What states can a bit be in?  
**Answer:** A binary digit can be in the logic 0 or logic 1 (TRUE or FALSE, ON or OFF, and LO or HI are acceptable answers) state.
3. What numbers can a bit represent?  
**Answer:** A bit can represent the numbers 1 and 0.
4. Draw the schematic of a simple digital switch. Why do these switches seldom appear as shown? (See Figure 1-1).  
**Answer:**

FIGURE 1-1. Simple Digital Switch



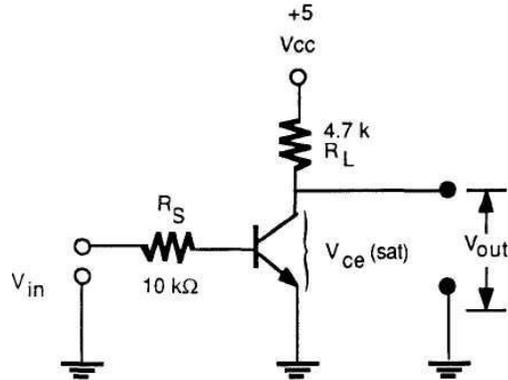
The contacts of the mechanical switch will bounce between states when the switch is activated. This can cause false triggering in logic circuits connected to the switch.

5. Who constructed the first integrated circuit?  
**Answer:** Texas Instruments constructed the first integrated circuit.
6. Name some qualities of an analog circuit.  
**Answer:** Analog circuits feature active devices such as a transistor operated in the linear region. The circuits are designed to amplify a signal with minimal distortion. The output range is limited so that the transistor is not driven into saturation.
7. Name some qualities of a digital circuit.  
**Answer:** A digital circuit is designed to switch quickly between the allowed digital states. A transistor operated in the saturated region forms a basic digital circuit. The output is at  $V_{cc}$  or "ground" except for brief switching times.

1. Draw the schematic for a simple BJT digital inverter. Explain its operation.

**Answer:**

FIGURE 1-2. BJT Inverter



The circuit is operated in the saturated region. When the input is  $V_{cc}$ , the circuit is saturated if  $I_c \gg (\beta) \times I_b$ . The output is a low voltage (0.2-0.6 V for a silicon BJT). When the input is near ground, the transistor is cut off and the output is  $V_{cc}$ .

9. Explain what an integrated circuit is.

**Answer:** An integrated circuit features multiple transistors on a single piece of silicon.

# 1.2 Labs

**This Chapter has no Laboratory**