Lab 26
Logic gates and combinational logic circuits

Goals
The goal of this exercise is to teach students familiar with binary codes, properties of logic gates and simple circuits based on logic gates. Learn how to solder.

ATTENTION: Use 5 V as power supply voltage.

1 Experiment
1.1 Draw the scheme of the connections via diodes, that changes decimal to one of the following codes: binary, Gray, 2421, 4221 or XS3 – exces-3.
1.2 Solder the diodes according to the prepared scheme.
1.3 Test the operation of the build system and demonstrate it to your TA.
1.4 In the table 1 write down what you observe during the test.

Table 1.

Kod dziesiętny	kod...

2.1 Design a circuit, with XOR gates, generating parity bit of 8-bit word. Using trainer board UNILOG-2 build and test the circuit. In the table 2 write down what you observe during the test.

Table 2.

A	B	C	D	E	F	G	H	Q

2.2 Build the circuit in Fig. 2a and experimentally determine the truth table. Repeat these steps for the circuit in Fig. 2b.

2.3 Use oscilloscope to measure the propagation time (delay time) for logic gates suggested by TA (NAND or NOR gates).

2.4 Using trainer board UNILOG-2 build the circuit shown in Fig. 3 and apply rectangular 1 MHz signal. Measure the pulse widths of the input and output pulses.

3 Background

3.1 Codes: Straight binary code, BCD code, Excess-3 Code, Two's complement, Gray code, Octal code, Hexadecimal code.

3.2 Soldering techniques.

3.3 Light-emitting diode (LED) operation.

3.4 Noise margins, propagation delay.

3.5 Positive and negative logic.

3.6 Logic gate symbols and basic rules of Boolean Algebra**.**

Literature

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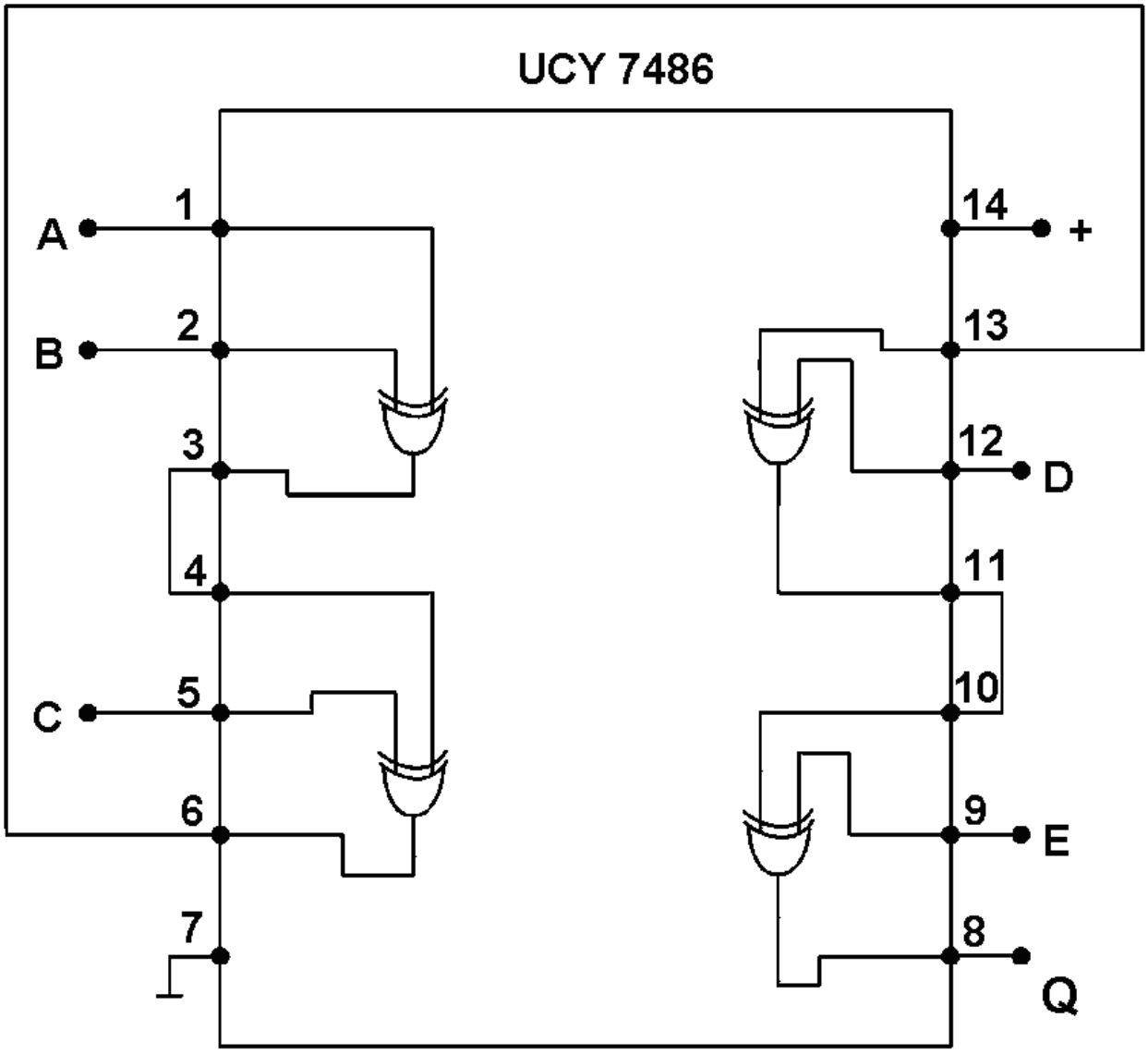

Fig. 1. Example circuit generating parity bit of 5-bit word.

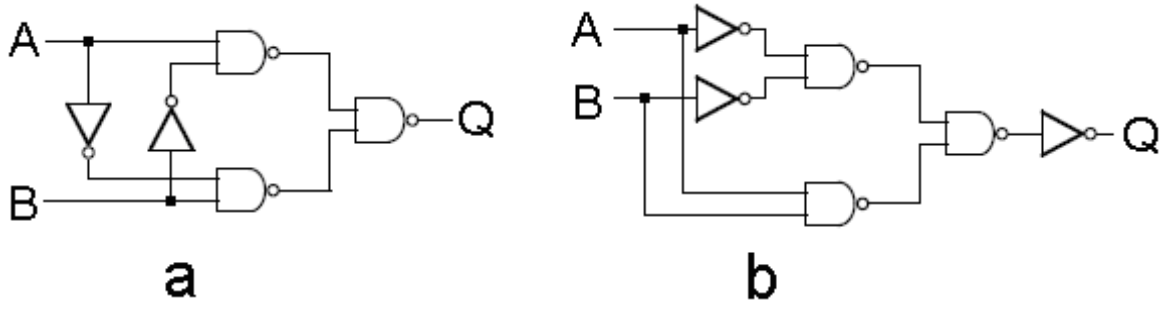

Fig. 2. Example combinational circuits.

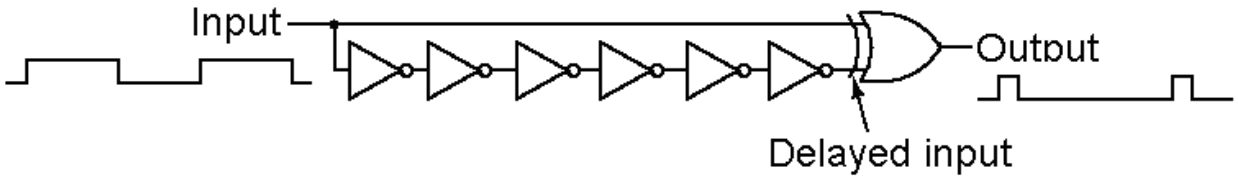

Fig. 3. Circuit for narrowing the rectangular pulses.