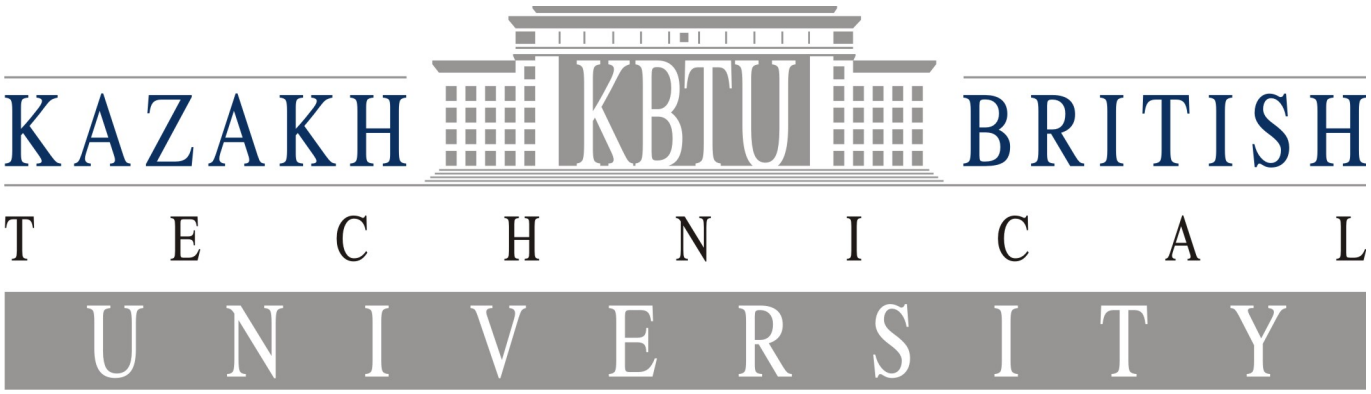

School of Information Technology and Engineering

Laboratory work 4
Seven-segment displays

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Almaty 2024

Aims:

investiagte seven- segment displays operation, understand the process of code conversion for the device, and make a comparison between 1 and 2 seven digit-segment displays.

Practice task:
Preparation to lab work

PREPARATION TO LAB WORK.

1 Learn the information about seven-segment displays
2 Consider scheme of experiment 4A and draw it using Scheme Design System.
3 Answer the questions below in written form.
- 3.1 What is an order to count pins of a chip?
- 3.2 What is a code conversion?
- 3.3 What is a BCD-to-seven-segment decoder?
- 3.4 What is the way to obtain #6 (or 2, or3 and so on) on the display?
- 3.5 Show the situation of segments from a to g on the display.
- 3.6 If we apply +5V to segments b and c we can see #____ on the display.
- 3.7 How many pins has the chip of seven-segment display got?
- 3.8 What shall we do with pins #3, 5, 8?
- 3.9 Show seven-segment display internal structure with LEDs.
- 3.10 What is another name of a seven-segment display?
- 3.11 What is the difference between conversion and coding of a decimal number?
- 3.12 Show the differences between 1- and 2-digit seven-segment display.

LAB WORK PERFORMANCE.

1. Demonstrate presence of your home preparation for lab work to your instructor.
2. Pass test of 10 questions.
3. Get a permission to begin the work.
4. Mount the scheme of experiment 4A on the breadboard and perform it.
5. Make a conclusion about functionality of the scheme. Compare your results with theoretical ones.
6. Demonstrate your results to your instructor. If your results are correct you may dismount your scheme, if no – find the mistake.
7. Mount the scheme of experiment 4B on the bread board. Use 2-digit seven-segment display of common cathode type.
8. Find which pin corresponds to appropriate segment, and fill in the table.
9. Repeat steps 7 and 8 for experiment 4C. Use another type of seven-segment display.
10. Be ready to answer your instructor's questions in process of work.
11. Complete your work, dismount your scheme, and clean your working place.
12. Answer your instructor's final questions, obtain your mark.
13. Ask your instructor's permission to leave.

Answers to Questions

3.1 The order to count pins of a chip typically starts from a specific corner or marking and proceeds in a clockwise or anti-clockwise direction.

3.2 Code conversion refers to the process of translating data from one format or code to another, such as converting binary-coded decimal (BCD) to a seven-segment display format.

3.3 A BCD-to-seven-segment decoder is a digital circuit that converts binary-coded decimal (BCD) input into the signals required to display the corresponding decimal digit on a seven-segment display.

3.4 To obtain a specific digit on the display, the appropriate combination of segments (a-g) needs to be activated according to the desired numeral.

3.5 The situation of segments from a to g on the display varies depending on which numeral is being displayed. Each numeral has a unique combination of segments that need to be illuminated.

3.6 If we apply +SV to segments b and c, we can see the numeral ”3” on the display.

3.7 The chip of a seven-segment display typically has 8 pins, including common cathode/anode pins and individual segment control pins.

3.8 Pins 3, 5, and 8 are typically connected to ground or voltage source based on the type of display (common cathode or common anode) and configuration requirements.

3.9 The internal structure of a seven-segment display consists of LEDs arranged in the shape of segments a to g, with each LED corresponding to one segment.

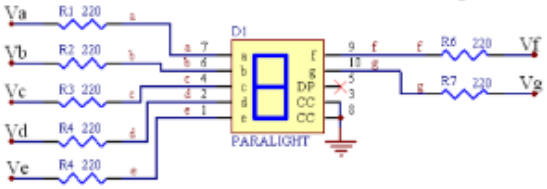
3.10 Another name for a seven-segment display is a ”seven-segment indicator” or simply ”seven-segment.”

3.11 The difference between conversion and coding of a decimal number lies in their processes. Conversion refers to changing the representation of a number from one format to another (e.g., BCD to seven-segment), while coding involves assigning symbols or signals to represent data (e.g., assigning binary codes to decimal digits).

3.12 To illustrate the differences between 1- and 2-digit seven-segment displays on Matlab, I’d need to provide a comparison of their structures, pin configurations, and potentially how they are controlled and interfaced with external circuits.

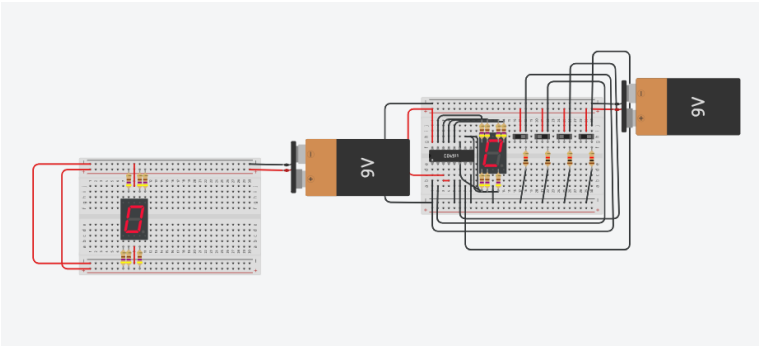
LAB WORK PERFORMANCE

Experiment 4A. Realize the following circuit on a breadboard. Connecting Va, Vb, Vc, Vd, Ve, Vf and Vg inputs to either GND or VCC based on the following table, fill in the blanks.



	Va	Vb	Vc	Vd	Ve	Vf	Vg	Display
1	5V	5V	5V	5V	5V	5V	0V	
2	0V	5V	5V	0V	0V	0V	0V	
3	5V	5V	0V	5V	5V	0V	5V	
4	5V	5V	5V	5V	0V	0V	5V	
5	0V	5V	5V	0V	0V	5V	5V	
6	5V	0V	5V	5V	0V	5V	5V	
7	0V	0V	5V	5V	5V	5V	5V	
8	5V	5V	5V	0V	0V	0V	0V	
9	5V	5V	5V	5V	5V	5V	5V	
10	5V	5V	5V	0V	0V	5V	5V	
11	5V	0V	5V	5V	0V	5V	5V	
12	0V	5V	5V	5V	5V	0V	5V	
13	0V	5V	5V	5V	5V	0V	5V	

Experiment 4B. Use 2-digit seven- segment display. Situate it on the breadboard. Pins 13 and 14 are connected to GND. Define which pin corresponds to which segment, show them in the picture. Fill in the table, showing the voltage for the numbers obtained. For example, V_1 is a voltage, applied to pin 1 and so on. Use resistors of 330(220)Ω to avoid the LED's burning.



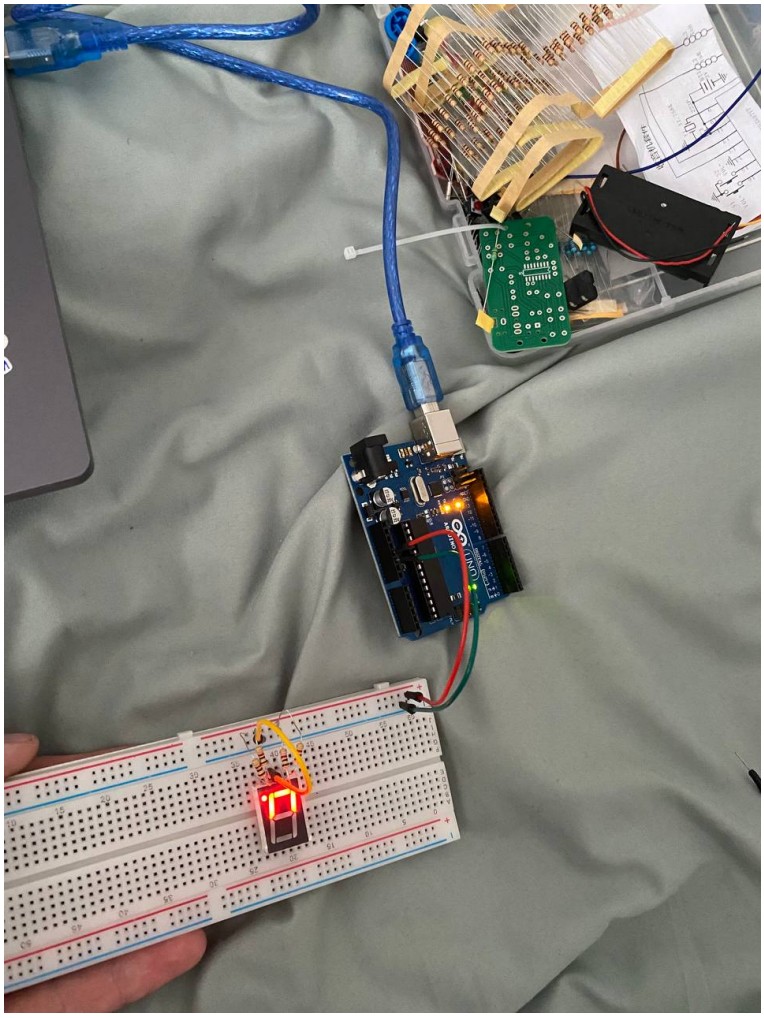


Table 1: AND

	Input	Input	Output	Output
	A	B	LED	V_out
1	0v	0v	0v	1.777nv
2	0v	5v	0v	-6.704
3	5v	0v	0v	3.066v
4	5v	5v	5v	0.278v