Technical University of Moldova
Inginerical department S.A.

Report

№: 3

ASDN

Subject: The Analysis and Synthesis of numerical devices

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1 Objectives

– verify the correct operation of the laboratory bench integrated circuits;

– assemble and adjust the schema of a binary-decimal decoder in the home theme in the AND-NO set;

– assemble and adjust the schema of a binary-decimal encoder in the home theme in the AND-NO set;

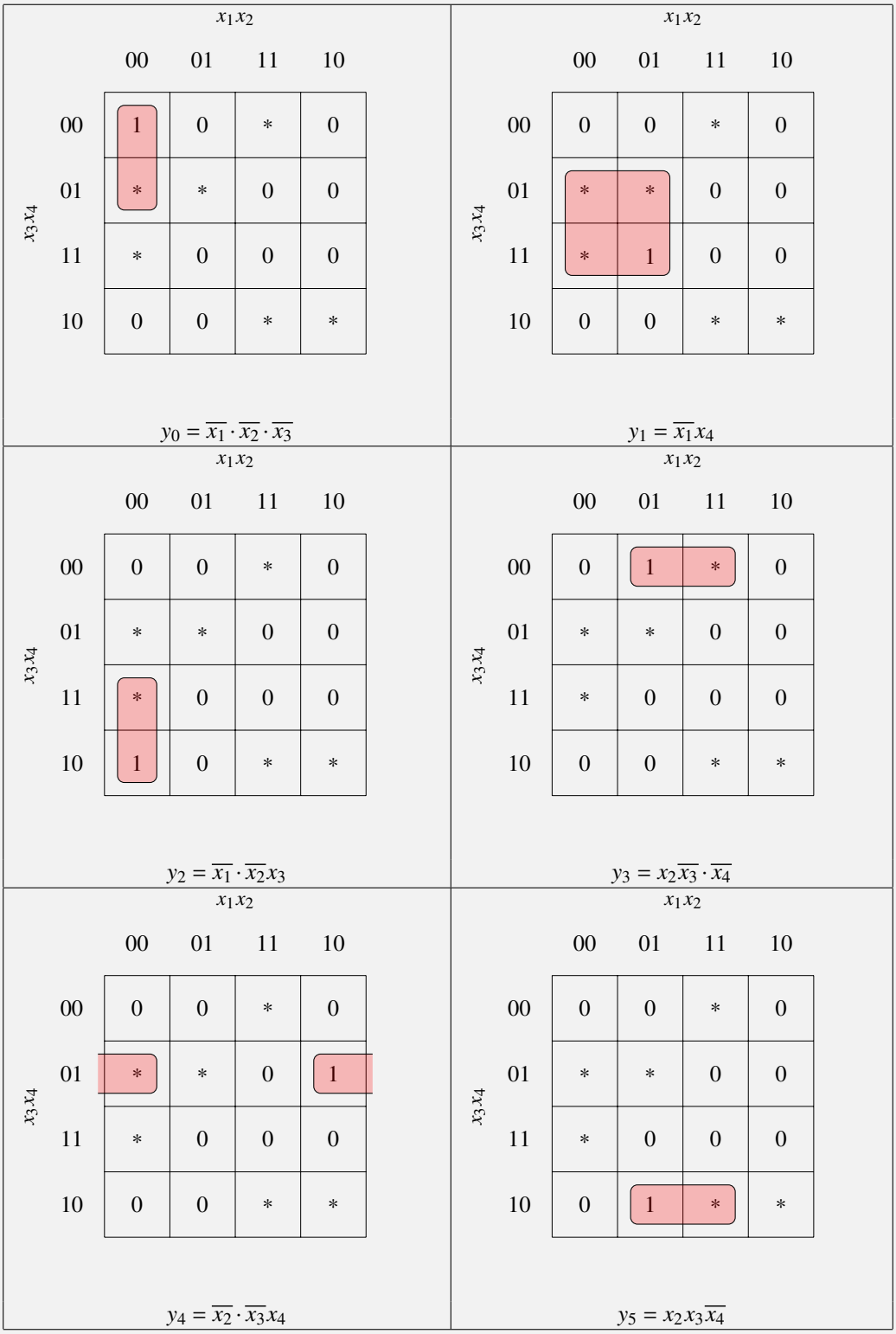
– for the assembled circuits the cost and the retention time are determined;

2 Docoder

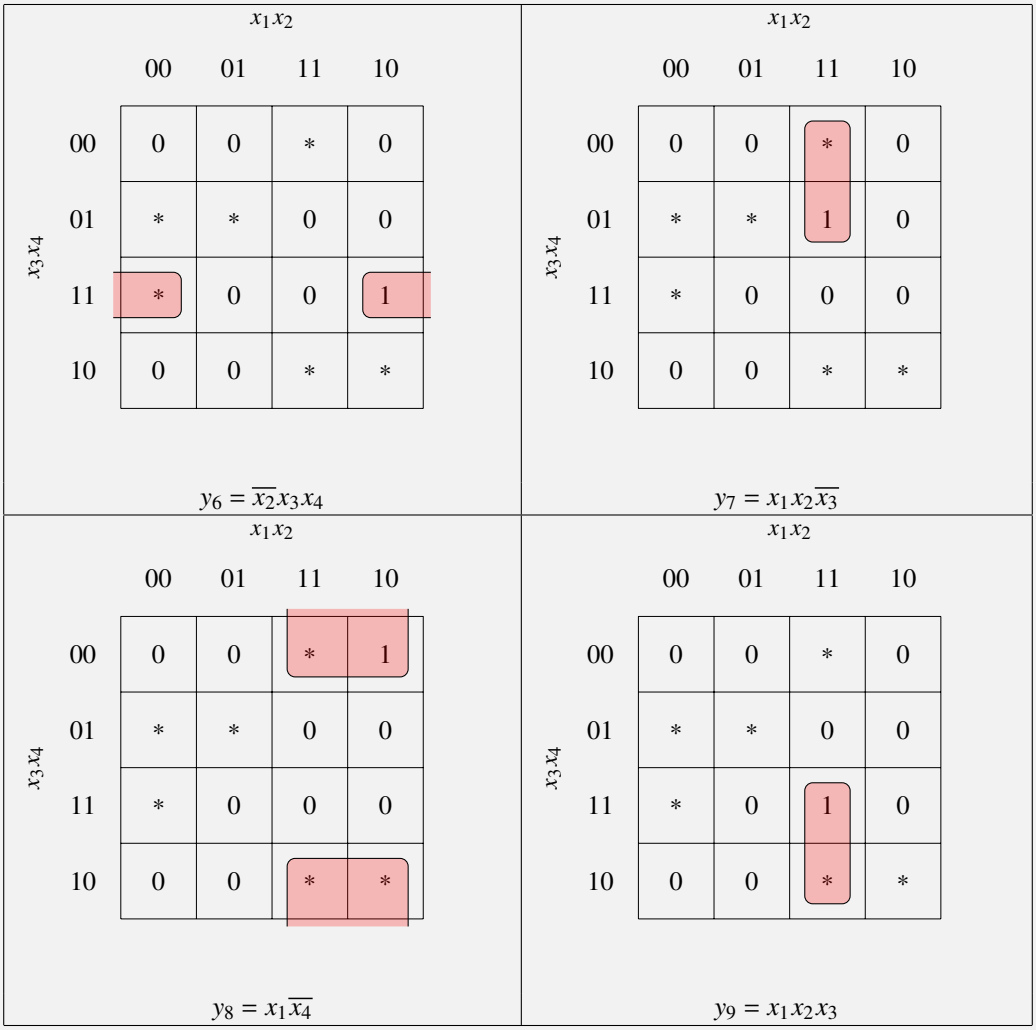
Encoder: 8 3 2 (-4)
Decoder: 5 2 1 1

Decimal numbers	Code				Functions									
	8	3	2	(-4)										
	x_1	x_2	x_3	x_4	y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1	0	1	1	1	0	1	0	0	0	0	0	0	0	0
2	0	0	1	0	0	0	1	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	1	0	0	0	0	0	0
4	1	0	0	1	0	0	0	0	1	0	0	0	0	0
5	0	1	1	0	0	0	0	0	0	1	0	0	0	0
6	1	0	1	1	0	0	0	0	0	0	1	0	0	0
7	1	1	0	1	0	0	0	0	0	0	0	1	0	0
8	1	0	0	0	0	0	0	0	0	0	0	0	1	0
9	1	1	1	1	0	0	0	0	0	0	0	0	0	1
	0	0	0	1										
	0	0	1	1										
	0	1	0	1										
	1	0	1	0										
	1	1	0	0										
	1	1	1	0										

Tab 1: Code decoder



Tab 2: Karnaugh maps (1)



Tab 3: Karnaugh maps (2)

3 Encoder

Decimal number	Inputs										Outputs			
											5	2	1	1
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
2	0	0	1	0	0	0	0	0	0	0	0	0	1	1
3	0	0	0	1	0	0	0	0	0	0	0	1	0	1
4	0	0	0	0	1	0	0	0	0	0	0	1	1	1
5	0	0	0	0	0	1	0	0	0	0	1	0	0	0
6	0	0	0	0	0	0	1	0	0	0	1	0	1	0
7	0	0	0	0	0	0	0	1	0	0	1	1	0	0
8	0	0	0	0	0	0	0	0	1	0	1	1	1	0
9	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	x_0	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	f_4	f_3	f_2	f_1

Tab 4: Encoder

$$f_1 = \overline{\overline{x_1} \cdot \overline{x_2} \cdot \overline{x_3} \cdot \overline{x_4} \cdot \overline{x_9}}$$

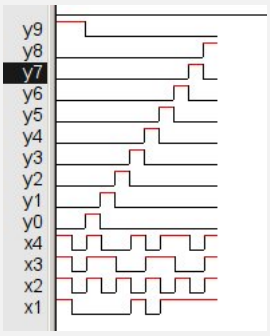
$$f_2 = \overline{\overline{x_2} \cdot \overline{x_4} \cdot \overline{x_6} \cdot \overline{x_8} \cdot \overline{x_9}}$$

$$f_3 = \overline{\overline{x_3} \cdot \overline{x_4} \cdot \overline{x_7} \cdot \overline{x_8} \cdot \overline{x_9}}$$

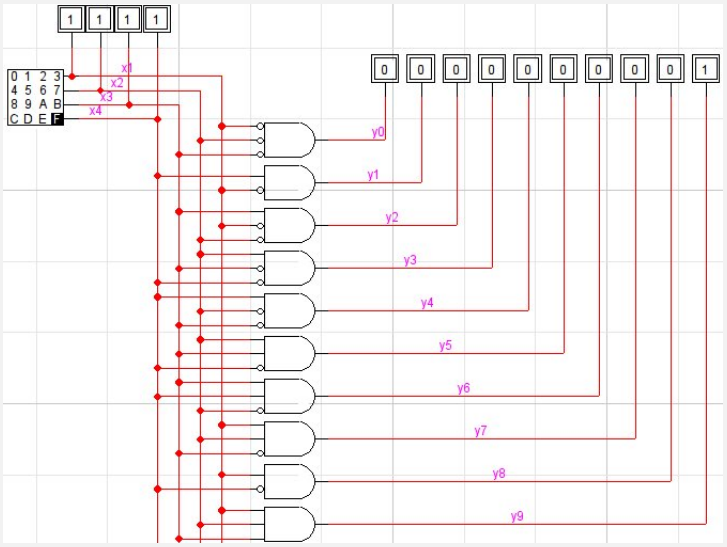
$$f_4 = \overline{\overline{x_5} \cdot \overline{x_6} \cdot \overline{x_7} \cdot \overline{x_8} \cdot \overline{x_9}}$$

Tab 5: NAND form of decoder functions

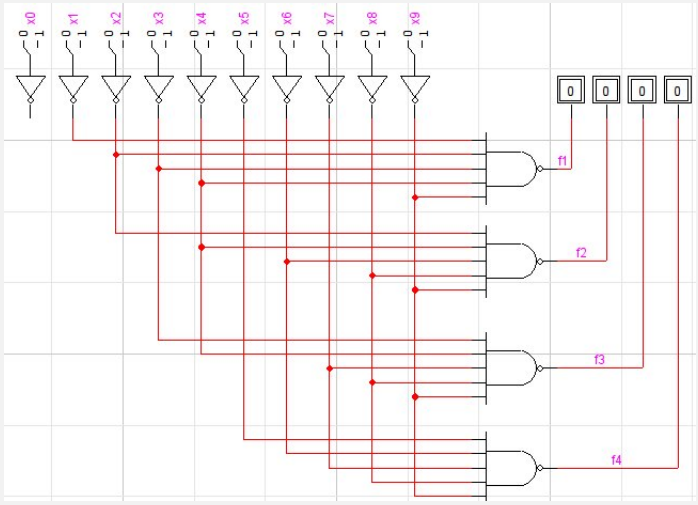
4 Circuits



Img 1: Decoder timer



Img 2: Decoder



Img 3: Encoder

Circuit	Cost	Time
1	28	1
2	30	2

Tab 6: Cost and time

5 Conclusion

This laboratory work taught me how to create circuits for decoders and encoders. They are extremely important parts of circuits and information interchange and processing can't be realized without them.