الجامعة العربية الأمريكية
ARAB AMERICAN UNIVERSITY

FACULTY OF ENGINEERING AND IT

COMPUTER SYSTEMS ENGINEERING DEPARTMENT

Digital Logic Design Lab Report

Decoder and Encoder

Date: 17/12/2023

Student Name:	Ghayda' Ja'aysah
Student ID:	202110568
Experiment Name:	Decoder & Encoder
Experiment No.:	5
Instructor Name:	Asem Salah
Supervisor Name:	Eyas Al-souqi
Section:	2
Partner Name if any:	Saja Jaradat , Dareen AbuZaineh

1. OBJECTIVES

This experiment aims to:

1.to study the operating principle of decoder

2. to implement applications of encoder .

3. to study the operating principle of multiplexer

2. INTRODUCTION

We are in huge world of digital components

Today we will introduce to encoder and multiplexer .

We will study how does it work and how to implement several function using IC's in practical
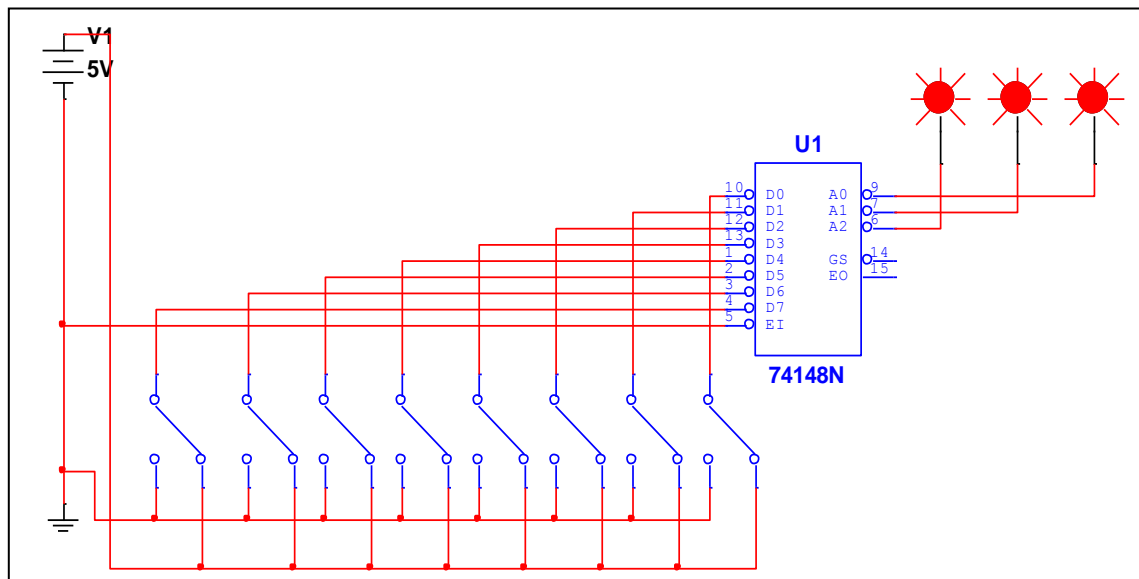
3. COMPONENTS REQUIRED:

ID	Component name	Amount
1	Bread board , wires	*1 , many*
2	*IC 74153 (4-1 multiplexer)*	*1*
3	IC 74148 (8-to-3 Encoder)	1

4. TASKS

1. *Implement the function F(A,B,C)=$\sum$(0,1,4,7) USING   4-to-1 multiplexer*
2. *Implement 8-to-3 Encoder*
3. *Adding two BCD numbers using pre-implemented circuit in ETS-800*

PART ONE : ENCODER

5. SYMBOLS AND DIAGRAMS

6. BOOLEAN EXPRESSION

A0 = D1' + D3' + D5' + D7'

A1 = D2' + D3' + D6' + D7'

A2 = D4' + D5' + D6' + D7'

7. TRUTH TABLE

Inputs									Outputs		
D7	D6	D5	D4	D3	D2	D1	D0	EI	A2	A1	A0
1	1	1	1	1	1	1	0	0	0	0	0
1	1	1	1	1	1	0	1	0	0	0	1
1	1	1	1	1	0	1	1	0	0	1	0
1	1	1	1	0	1	1	1	0	0	1	1
1	1	1	0	1	1	1	1	0	1	0	0
1	1	0	1	1	1	1	1	0	1	0	1
1	0	1	1	1	1	1	1	0	1	1	0
0	1	1	1	1	1	1	1	0	1	1	1

8. PROCEDURES

1. *Connect D0-D7 TO SW0-SW7 respectively*
2. *Connect A3 TO GND*
3. *Connect A2 , A1 , A0 directly to BCD displayer*
4. *Connect EO TO LED0*
5. *Connect GS to LED1*

9. EXPERIMENT RESULTS

Inputs									Outputs		
D7	D6	D5	D4	D3	D2	D1	D0	EI	A2	A1	A0
SW7	SW6	SW5	SW4	SW3	SW2	SW1	SW0	GND	C	B	A
0	0	0	0	0	0	0	0	0	GREEN	GREEN	GREEN
5V	5V	5V	5V	5V	5V	5V	5V	0	RED	RED	RED
0	5V	5V	5V	5V	5V	5V	5V	0	GREEN	GREEN	GREEN
5V	0	5V	5V	5V	5V	5V	5V	0	GREEN	GREEN	RED
5V	5V	0	5V	5V	5V	5V	5V	0	GREEN	RED	GREEN
5V	5V	5V	0	5V	5V	5V	5V	0	GREEN	RED	RED
5V	5V	5V	5V	0	5V	5V	5V	0	RED	GREEN	GREEN
5V	5V	5V	5V	5V	0	5V	5V	0	RED	GREEN	RED
5V	5V	5V	5V	5V	5V	0	5V	0	RED	RED	GREEN
5V	5V	5V	5V	5V	5V	5V	0	0	RED	RED	RED

10. DISCUSSIONS AND CONCLUSIONS

Our decoder inputs work on low voltage . that mean all inputs should be active unless the input you want to select(disply) it should was in-active , but we come with small problem (significant digits)

We connect D7 with SW7 which the most significant digit . but unfortunately the job woks the other way around .

D0 acticve 1 1 1 which indicate to D7 , we can solve this problem by swapping the wires .

Another thing we came into , that this circuit is low priority , which mean if D0 and D3 zero's

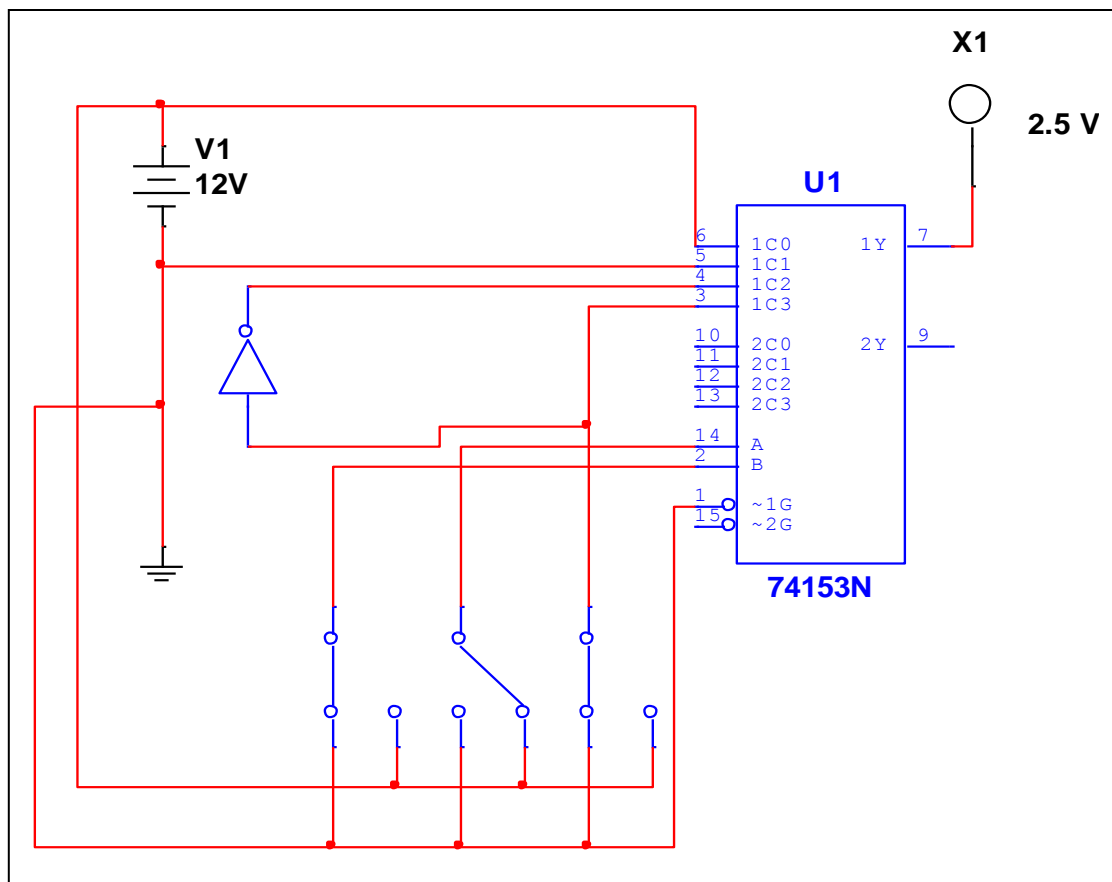*The output will be 000 not 011 .*

So if you want to work as significant digits you have to swap wires which means

D0 WITH most-significant digit

D7 WITH least-significant digit .

PART 2 : implement F=(0,1,4,7) USING 4-1 Multiplexer

11. SYMBOLS AND DIAGRAMS

12. BOOLEAN EXPRESSION

$I_0 = 1$

$I_1 = 0$

$I_2 = C'$

$I_3 = C$

13. TRUTH TABLE

Input			Output
A	B	C	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

14. PROCEDURES

1. Connect I0 to VCC
2. Connect I1 to GND
3. Connect I2 to C'
4. Connect I3 to C
5. Connect C to SW1
6. Connect B to SW2
7. Connect A to SW3
8. Connect F to LED6

15. EXPERIMENT RESULTS

Input			Output
A	B	C	F
SW3	SW2	SW1	LED6
0	0	0	RED
0	0	5V	RED
0	5V	0	GREEN
0	5V	5V	GREEN
5V	0	0	RED
5V	0	5V	GREEN
5V	5V	0	GREEN
5V	5V	5V	RED

16. DISCUSSIONS AND CONCLUSIONS

The multiplexer have four inputs , one output , in this experiment we have to implement the function above using multiplexer so we have to decide the relation between input to have the correct output .

We have 3 inputs A , B , C we decide to let A,B the selector .

And Compare F with C for same value of A,B .

Our experiment done successfully and we come into the correct output .

The multiplexer decide the output according to it's inputs