3 to 8 Decoder through Assembly Programming

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CONTENTS

***Abstract*—This document shows how to use Arduino UNO as a 3 to 8 Decoder through Assembly language.**

I. COMPONENTS

Component	Value	Qunatity
Resistor	220Ohm	8
LED	Red	8
Arduino	UNO	1
Jumper Wires	M-M	20
BreadBoard		1

TABLE I

II. HARDWARE

Problem 2.1 Make connections between the Arduino UNO and LED's as shown in Table 2

Problem 2.2 Connect anodes of LED's to the pins using resistors and cathodes to ground(gnd).

d2	d3	d4	d5	d6	d7	d8	d9
led1	led2	led3	led4	led5	led6	led7	led8

TABLE II

III. SOFTWARE

Problem 3.1 Now execute the following program and verify all the outputs as mentioned in Truth table (Table 3) by modifying the values of X, Y, Z to 0's and 1's respectively in the code.

wget https://github.com/mygit-sampath-govardhan/fwc-iith-assignments/blob/b6690f43eb5bc1611b0c168f966a3cecd021d40a/Assignment-2/Assignment2-code.asm

X	Y	Z	A	B	C	D	E	F	G	H
-	-	-	d8	d9	d10	d11	d12	d13	d6	d7
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	0
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

TABLE III
TRUTH TABLE

Note: Here Inputs are X,Y,Z whose values are set in the code and Outputs are A,B,C,D,E,F,G,H (d8-d13,d6-d7) respectively.

Solution : In the Truth table (Table3) X,Y,Z are inputs and A,B,C,D,E,F,G,H are outputs. This table represents the system that behaves as a 3 to 8 decoder. Using Boolean logic,

H= X' Y' Z'

H
eor X,0x01
eor Y,0x01
eor Z,0x01
and X,Y
and X,Z

G= X' Y' Z

G
eor X,0x01
eor Y,0x01
and X,Y
and X,Z

F= X’ Y Z’

F
eor X,0x01
eor Z,0x01
and X,Y
and X,Z

E= X’ Y Z

E
eor X,0x01
and X,Y
and X,Z

D= X Y’ Z’

D
eor Z,0x01
eor Y,0x01
and X,Y
and X,Z

C= X Y’ Z

C
eor Y,0x01
and X,Y
and X,Z

As this is Assembly Language we use ”eor” for XOR operations which is used for Complimenting a Register, operations like ”and”,”or” to represent a boolean output and DDR for defining a PORT as input or output.

B
eor Z,0x01
and X,Y
and X,Z

A
and X,Y
and X,Z

A= X Y Z

B= X Y Z’

IV. Conclusion

A 3 to 8 decoder has 3 inputs and 8 outputs are generated using these 3 inputs.

Here 3 to 8 decoder has been successfully verified.