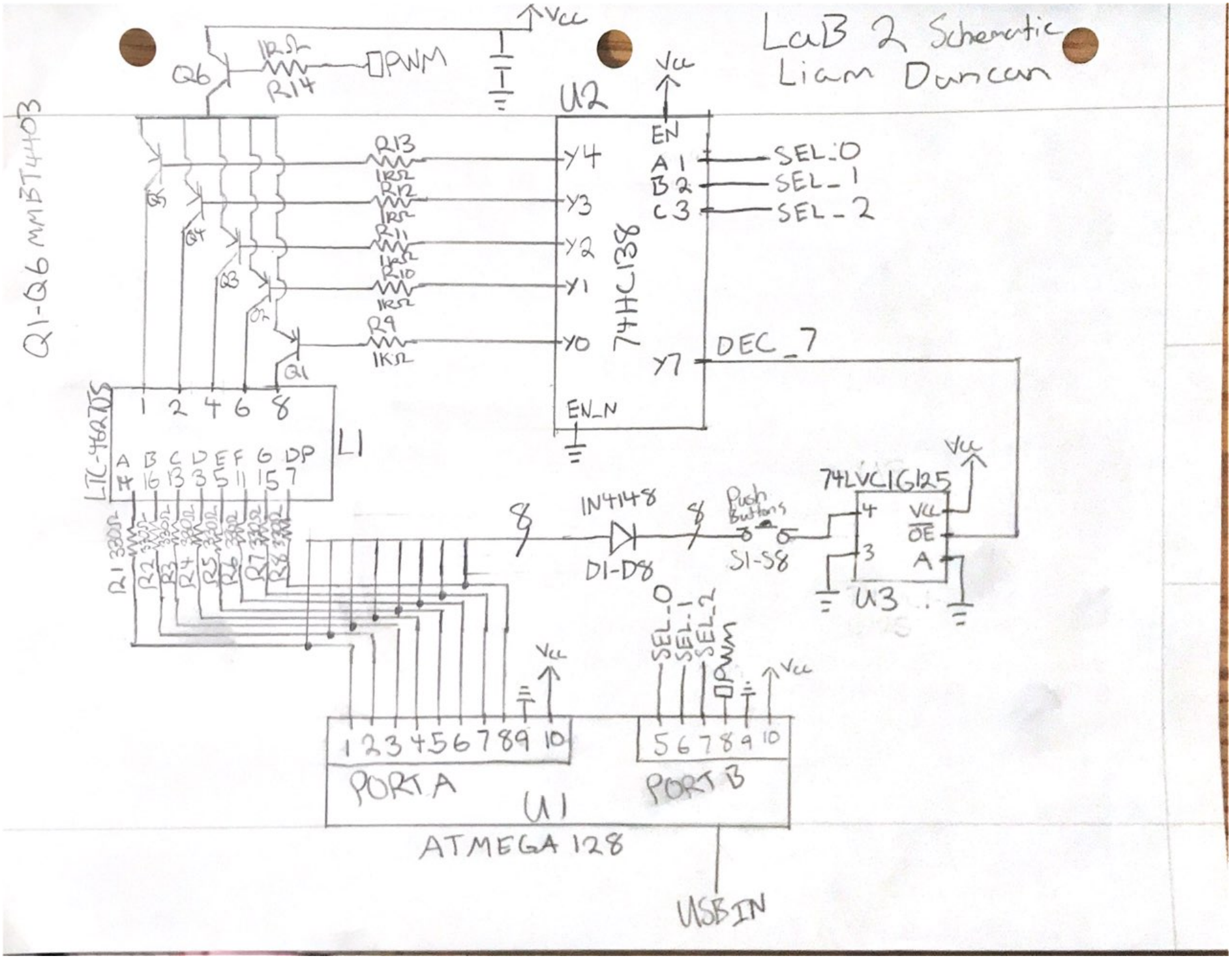
LaB 2 Schematic
Liam Duncan
Q1-Q6 MMBT4403
Vcc
Q6
1KΩ
R14
PWM
U2
EN
A 1
B 2
C 3
SEL_0
SEL_1
SEL_2
R13
R12
R11
R10
R9
1KΩ
Y4
Y3
Y2
Y1
Y0
Y7
DEC_7
EN_N
74HC138
Q5
Q4
Q3
Q2
Q1
LTC-4627JS
1 2 4 6 8
A B C D E F G DP
7 6 13 3 5 11 15 7
L1
R1 330Ω
R2 330Ω
R3 330Ω
R4 330Ω
R5 330Ω
R6 330Ω
R7 330Ω
R8 330Ω
8
IN4148
D1-D8
8
Push Buttons
S1-S8
74LVC1G125
4
VCC
OE
3
A
U3
1 2 3 4 5 6 7 8 9 10
PORT A
5 6 7 8 9 10
PORT B
U1
ATMEGA 128
SEL_0
SEL_1
SEL_2
PWM
USBIN

a) LED Segment Resistor Calculations

Resistor options are 330Ω, 1KΩ, or 10KΩ

According to Atmega128 datasheet.
I/O pins output high Voltage is minimum 4.2V
Max current per pin is 40mA
Max current per segment in LED display is 25mA and 40mW
Assuming Atmega is sending a max of 5V and we want current to equal 20mA so it is not at max
so, $V = IR$ $R = \frac{V}{I} = \frac{5}{20 \times 10^{-3}} = 250\,\Omega$ Our closest Resistor is 330Ω
this will give us $\frac{V}{R} = I = \frac{5}{330} = 15mA$
which is a good safe current number.
This also gives us some slack the resistor could be smaller.

b) You know the light will be visible because according to the LT-46275S Datasheet, at 15mA, the Relative luminous intensity is 1.5 which is visible by human eye.

c) Calculate Base resistor

From 74HC138 Datasheet
Output Voltage is 4.5V
Assume $I_c = 120mA$, so $hFE = 100$

$$I_b = \frac{120mA}{100} = 1.2mA$$

$$R_B = \frac{4.5 - .95}{1.2 \times 10^{-3}} = 2958\Omega$$

Pick closest option **1kΩ**

Connect Tri-state Buffer enable to 74HC138 Y7 output so that it is only enabled when A, B, and C are high. tie lvl to ground.