Q1-Q6 rory lange
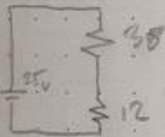
Final Exam

Q1) 1) B    2) A    3) C    4) B    5) D

6) A    7) B    8) B    9) C    10) A

11) B    12) D    13) C    14) D    15) D

16) A    17) A    18) B    19) C    20) A

21) C

Q2) a) $V_{R_1} = V_S \left( \frac{R_1}{R_{eq}} \right)$

$\frac{1}{R_{eq}} = \frac{1}{20} + \frac{1}{30}$
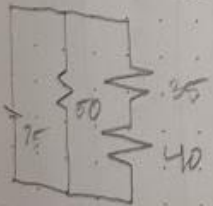
$I = \frac{V}{R}$

$\frac{1}{R_{eq}} = \frac{30}{600} + \frac{20}{600}$



$\frac{1}{R_{eq}} = \frac{50}{600}$

$R_{eq} = 12\,\Omega$

$I = \frac{V}{R} = \frac{25}{50} = \boxed{0.5 \text{ Amps}}$

b) $\frac{1}{R_{eq}} = \frac{1}{35} + \frac{1}{40}$

$\frac{1}{R_{eq}} = \frac{50}{18.6} + \frac{1}{50}$

$= \frac{40 + 35}{35 \cdot 40}$

$= \frac{18.6 + 50}{930}$



$= \frac{75}{1400} = 18.6$

$= \frac{68 \cdot 6}{930}$

$= 13.56$

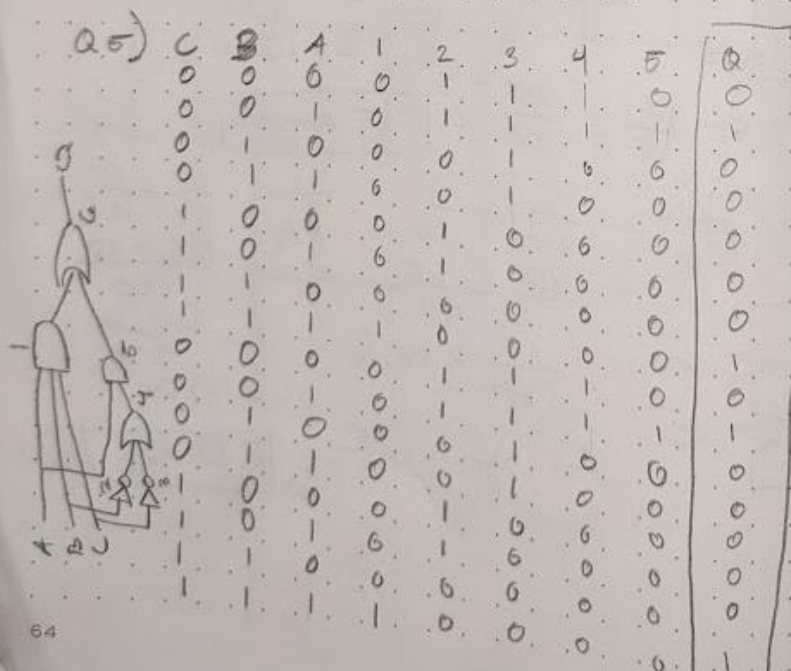$I = \frac{V}{R} = \frac{75}{13.56} = \boxed{5.53 \text{ Amps}}$

83

Q3) $(129)_{10} = \boxed{(0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 1)_2}$ Bin

(256 128 64 32 16 8 4 2 1)

$(0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 1)_2$    $(0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 1)$

8    1          4    0    1

$\boxed{(81)_{16}}$ Hex         $\boxed{(4.01)_8}$  Octal

Q4)   1101  1000  1011  0001

or    0000  1011  1111  0000

      1101  1011  1111  0001

and   1111  1111  1101  1111

$\boxed{1101 \quad 1011 \quad 1101 \quad 0001}$

Q5)



| C | B | A | 1 | 2 | 3 | 4 | 5 | Q |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

Q6)

Q6)

Arduino UNO

5V

13

11

8

GND

R₁  R₂  R₃

Q7 Rory Lange
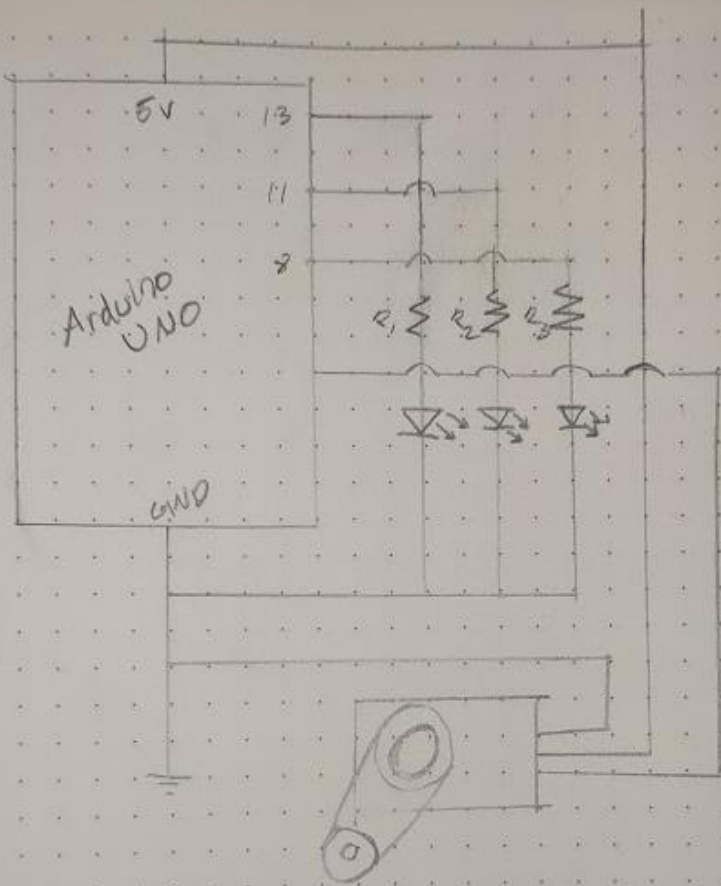
```
final.txt
1    int pinButton = 2;
2    int leds[] = {6,7,8};
3
4
5    void setup() {
6           pinMode(pinButton, INPUT);
7           for (int i = 0; i < 3; i++) {
8                   pinMode(leds[i], OUTPUT);
9           }
10   }
11
12   void loop() {
13          int state = digitalRead(pinButton);
14
15          if (state == 0) {
16                  for (int i = 0; i < 3; i++) {
17                          digitalWrite(leds[i], HIGH);
18                  }
19          }
20
21          else {
22                  for (int i = 0; i < 3; i++) {
23                          digitalWrite(leds[i], LOW);
24                  }
25          }
26   }
```

Q8

```
finalq8.txt
1    int dataPin = 4;
2    int latchPin = 5;
3    int clockPin = 6;
4
5    int seq[] = {0,1,2,4,8,16,32,64,128,64,32,16,8,4,2};
6
7    void setup() {
8        pinMode(latchPin, OUTPUT);
9        pinMode(clockPin, OUTPUT);
10       pinMode(dataPin, OUTPUT);
11   }
12
13   void loop() {
14       for (int i = 0; i < 15; i++) {
15           digitalWrite(latchPin, HIGH);
16           shiftOut(dataPin, latchPin, LSBFIRST, seq[i]);
17           digitalWrite(latchPin, LOW);
18           delay(1000);
19       }
20   }
```

Q9

```
finalq9.txt
1    #include <LiquidCrystal.h>
2    LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
3    // make some custom characters:
4    byte heart[8] = {
5    0b00000,
6    0b01010,
7    0b11111,
8    0b11111,
9    0b01110,
10   0b00100,
11   0b00000,
12   0b00000 };
13
14   byte emptyHeart[8] = {
15   0b00000,
16   0b01010,
17   0b10101,
18   0b10001,
19   0b01010,
20   0b00100,
21   0b00000,
22   0b00000 };
23
24   byte smile[8] = {
25   0b00000,
26   0b01010,
27   0b00000,
28   0b00000,
29   0b10001,
30   0b01110,
31   0b00000,
32   0b00000 };
33
34   byte omega[8] = {
35   0b00000,
36   0b01110,
37   0b10001,
38   0b10001,
39   0b10001,
40   0b01010,
41   0b01010,
42   0b11011 };
43
```

```
44    byte box[8] = {
45    0b11111,
46    0b10001,
47    0b10001,
48    0b10001,
49    0b10001,
50    0b10001,
51    0b10001,
52    0b11111 };
53
54    void setup() {
55    lcd.begin(16, 2);
56    lcd.createChar(0, heart);
57    lcd.createChar(1, emptyHeart);
58    lcd.createChar(2, smile);
59    lcd.createChar(3, omega);
60    lcd.createChar(4, box);
61    // Clears the LCD screen
62    lcd.clear();
63    lcd.print("Custom Character");
64    }
65
66    // Print All the custom characters
67    void loop() {
68    lcd.setCursor(0, 1);
69    lcd.write(byte(0));
70    lcd.setCursor(2, 1);
71    lcd.write(byte(1));
72    lcd.setCursor(4, 1);
73    lcd.write(byte(2));
74    lcd.setCursor(6, 1);
75    lcd.write(byte(3));
76    lcd.setCursor(8, 1);
77    lcd.wriet(byte(4));
78    }
```