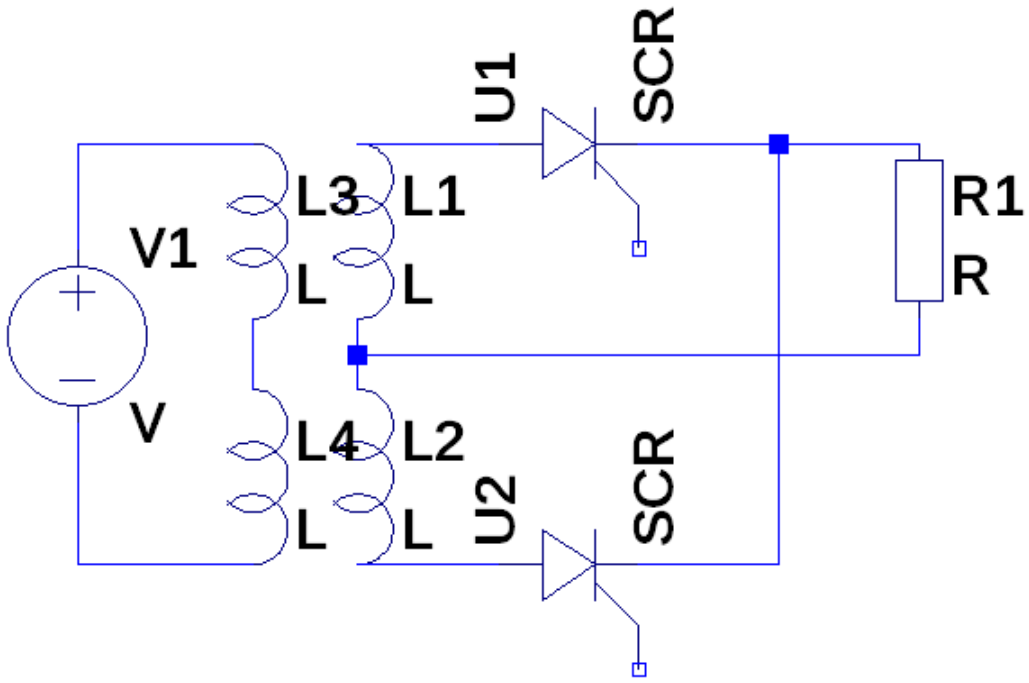
Lab 3: Controlled rectification

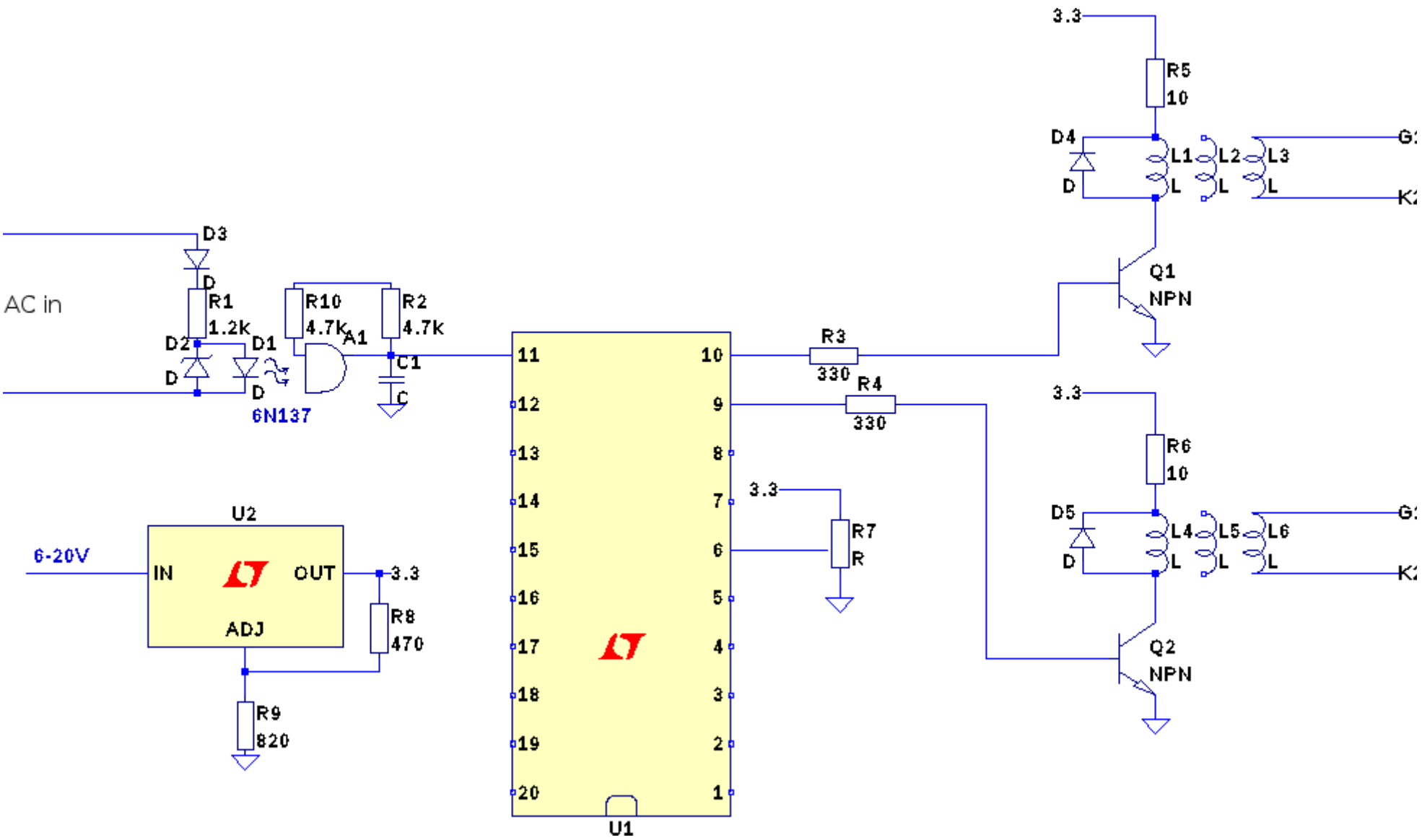
Part 1: Construction of rectifier power circuit.



Part 2: Commissioning of control circuit

Apply 6V to DC Voltage regulator input, check for 3.3V (approx) out.
Apply AC input (very carefully) and check voltage clamping by zener. Check output from 6N137 is a square wave.
Check voltage from potentiometer varies
Look for pulses coming from pins 9 and 10 of MSP430.

Connect Gates and Cathodes (K) to power circuit.


AC in
D3
D
R1
1.2k
D2
D
D1
D
6N137
R10
4.7k
A1
R2
4.7k
C1
C
U2
6-20V
IN
OUT
ADJ
3.3
R8
470
R9
820
11
12
13
14
15
16
17
18
19
20
10
9
8
7
6
5
4
3
2
1
U1
R3
330
R4
330
3.3
R7
R
3.3
R5
10
D4
D
L1
L2
L3
L
L
L
Q1
NPN
3.3
R6
10
D5
D
L4
L5
L6
L
L
L
Q2
NPN

Part 3: Things to measure and record.

Average Vo vs firing angle.
Output waveform with resistive load
Output waveform with inductive load
Gate pulse waveform.

Questions:

What is meant by the terms **latching current** and **holding current**. – any evidence of either in circuit?
What would change for 240V operation?
Sketch a forced commutation circuit for a thyristor.

Appendix: Microcontroller code

```
void setup()
{
  // put your setup code here, to run once:
  pinMode(P2_1,OUTPUT);
  pinMode(P2_2,OUTPUT);
  pinMode(P2_3,INPUT);
  digitalWrite(P2_2,LOW);
  digitalWrite(P2_1,LOW);

}
void pulsePort(int Port)
{
  int i;

  {
    digitalWrite(Port,HIGH);
    __delay_cycles(10);
    digitalWrite(Port,LOW);
    __delay_cycles(10);
  }
}
void loop()
{
  // put your main code here, to run repeatedly:
  // Wait for rising edge on P1.1 (ZCD)
  while(digitalRead(P2_3)==0);
  delay(analogRead(P1_4)/100);

  pulsePort(P2_1);
  while(digitalRead(P2_3)!=0);
  delay(analogRead(P1_4)/100);

  pulsePort(P2_2);

}
```