ELEC4170 LAB REPORT 1

Chapter 1 Diode Rectifier

Your Name and Student ID

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Task 1
Single-phase half-wave diode rectifier with R load

a) Schematics

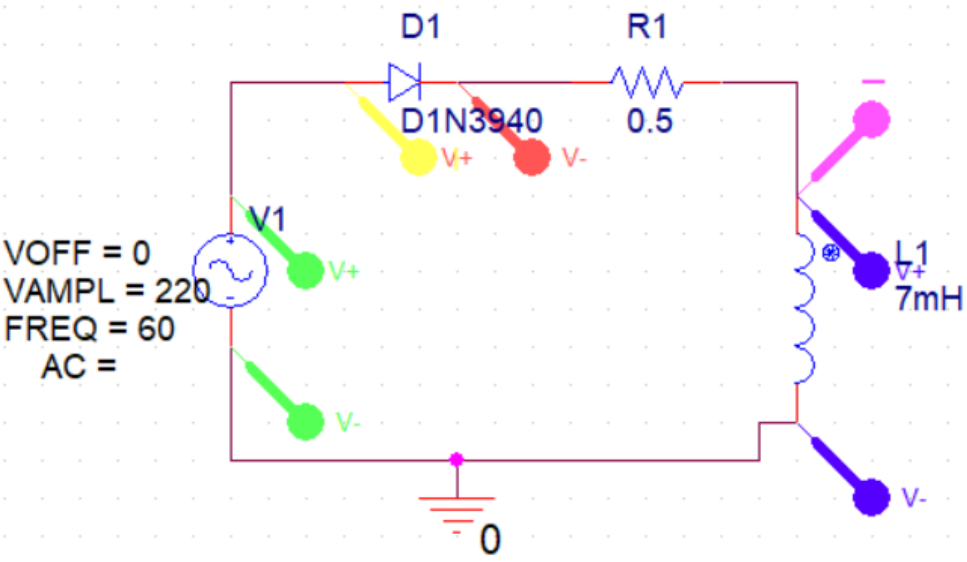


Figure 1: Single-phase half-wave diode rectifier with R.

b) Waveforms

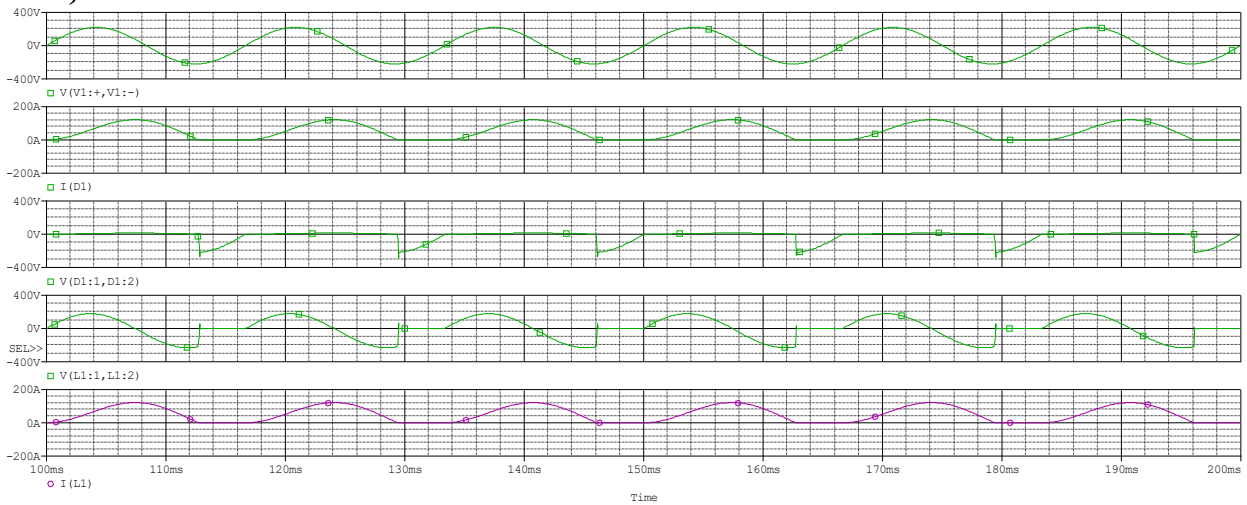


Figure 2: Single-phase half-wave diode rectifier with R outputs.

c) Conclusions

Because of the forward biased principle for a diode, only the positive flowing current can pass through.Negative cycle is stopped to go to output because of diode reverse condition.

Task 2

Single-phase half-wave diode rectifier with parallel RC load

a)Schematics

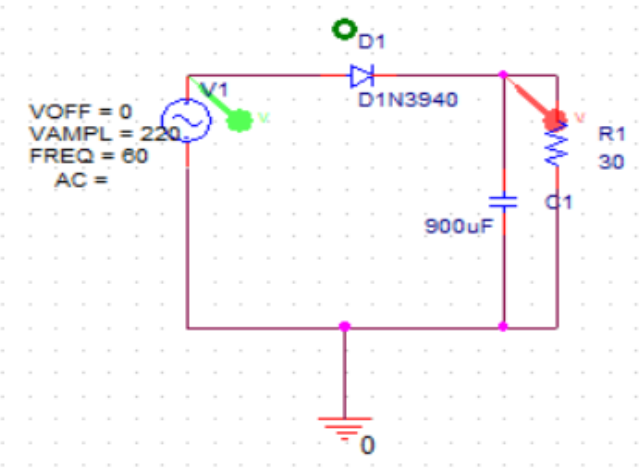
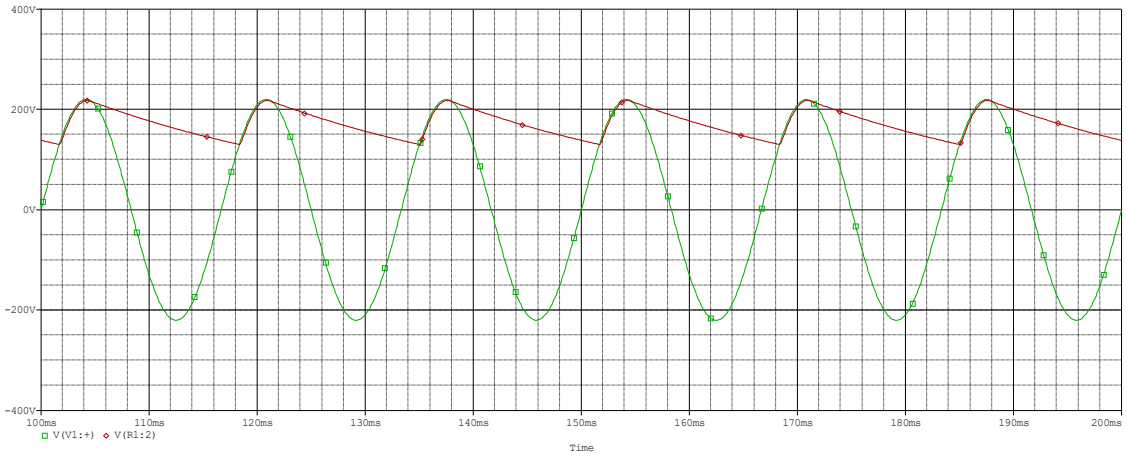


Figure 1: Single-phase half-wave diode rectifier with RC Load

b)Output



c)Result

RC circuit smoothes the rectified output, reducing the ripple and making the output voltage closer to a DC signal. However, as seen in the green curve, there is still a noticeable ripple due to the capacitor discharging between cycles.

Task 3

Single-phase Full-wave diode rectifier with R load

a)Schematics

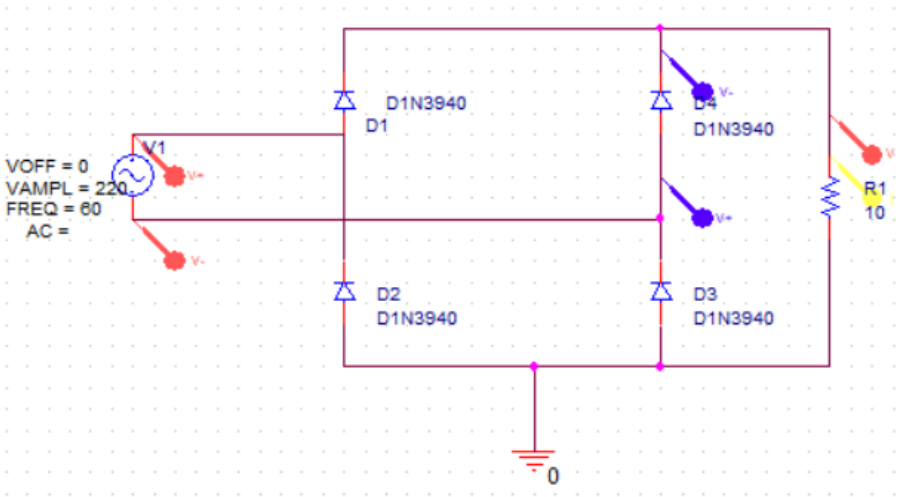
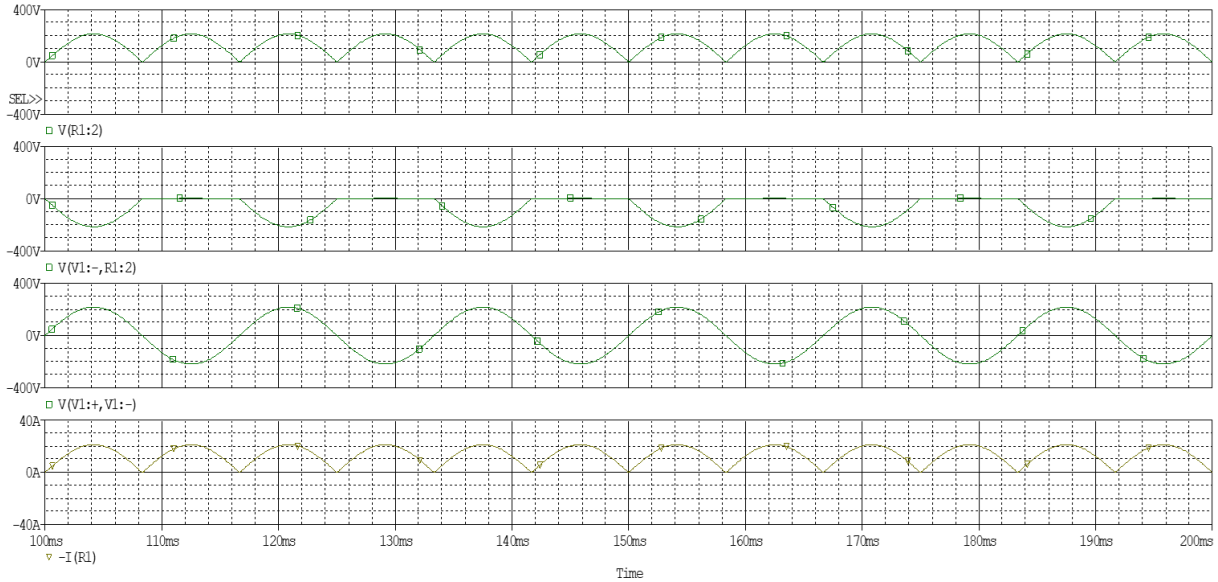


Figure 1: Single-phase full-wave diode rectifier with R Load

b)Output



c)Result

Full Wave Rectifier is showing that we are getting both cycles of input at output but on positive sides.Diode voltage drop is 0.7V.Output current is calculated as I=V/R. Circuit smoothes the rectified output, reducing the ripple and making the output voltage closer to a DC signal.

Task 4
Single-phase Full-wave diode rectifier with RL load

a)Schematics

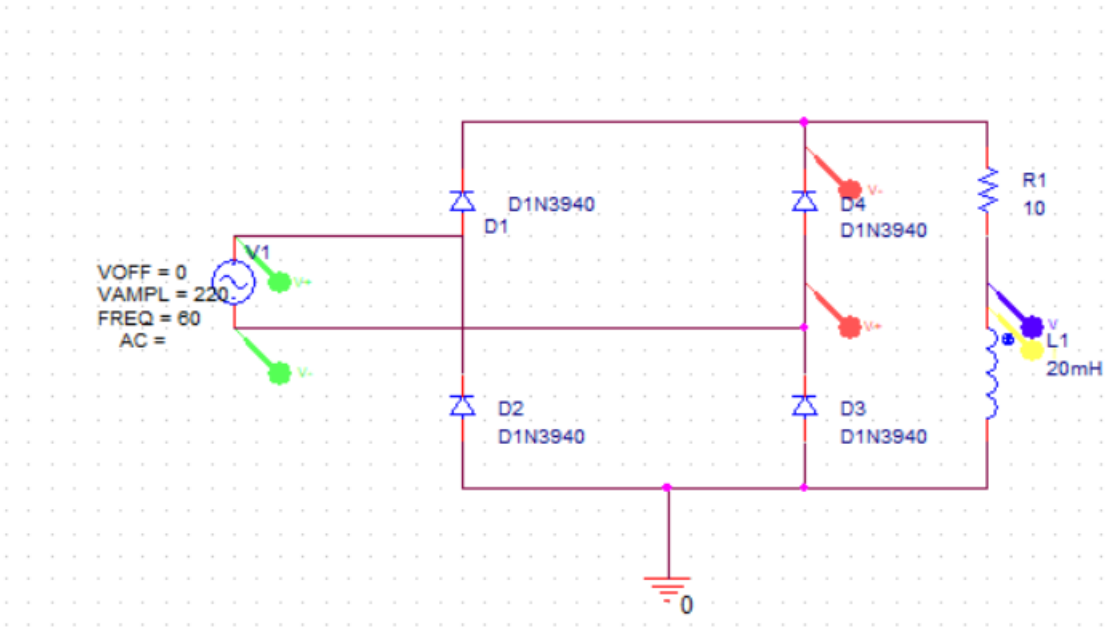
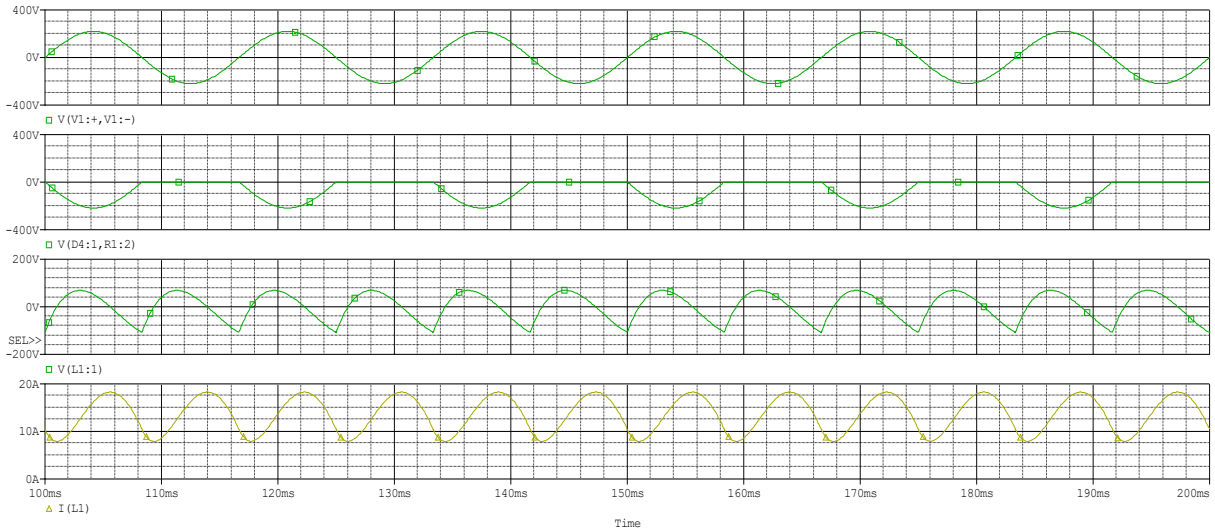


Figure 1: Single-phase full-wave diode rectifier with RL Load

b)Output



c)Result

This experiment successfully demonstrated the operation and characteristics of a full-wave rectifier with an RL load, highlighting its effectiveness in converting AC input to pulsating DC output. The addition of the RL load significantly impacted the output waveform compared to a resistive load alone, with the inductor reducing ripple in the output voltage and acting as a smoothing element. Output voltage and current waveforms exhibited phase differences due to the inductive component, and experimental results closely matched theoretical predictions, validating our understanding of the circuit's behavior.

Task 5
Three-phase Half-wave diode rectifier with R load

a)Schematics

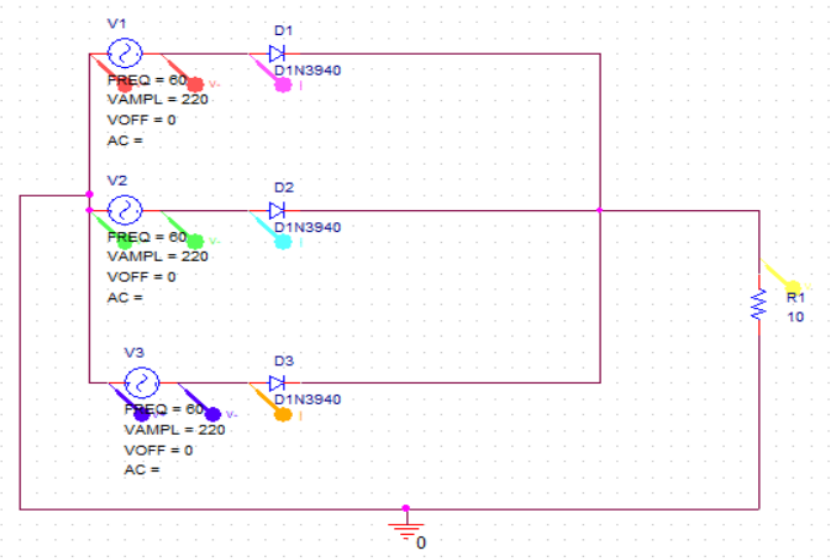
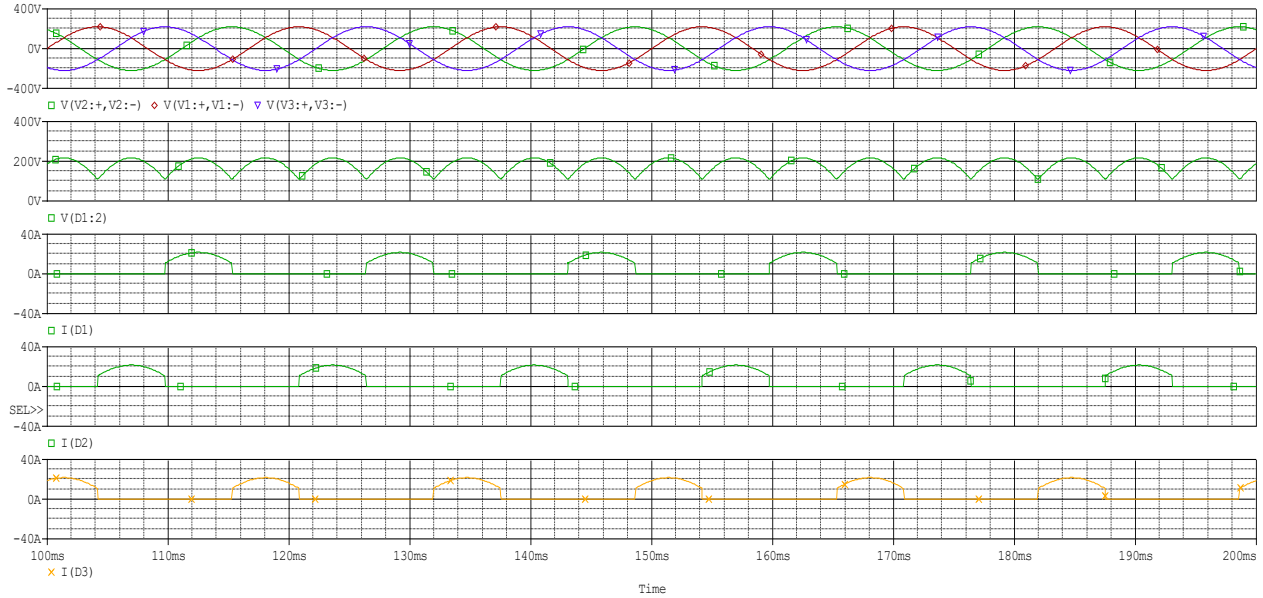


Figure 1: Three-phase Half-wave diode rectifier with R Load

b)Output



c)Result

This experiment successfully demonstrated the operation and characteristics of a three-phase half-wave rectifier, highlighting its advantages over single-phase rectifiers. The circuit effectively converted three-phase AC input into a pulsating DC output with reduced ripple compared to single-phase counterparts. Key observations included the 120° phase shift between input waveforms, the increased output frequency of 3f.

Task 6
Three-phase Full-wave diode rectifier with R load

a)Schematics

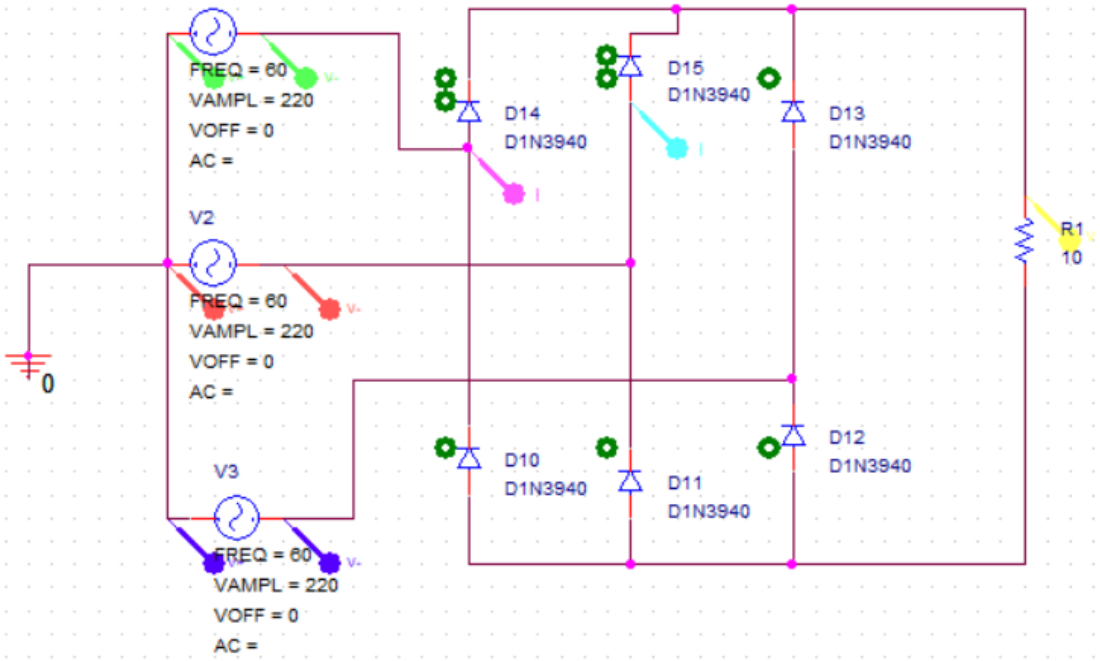
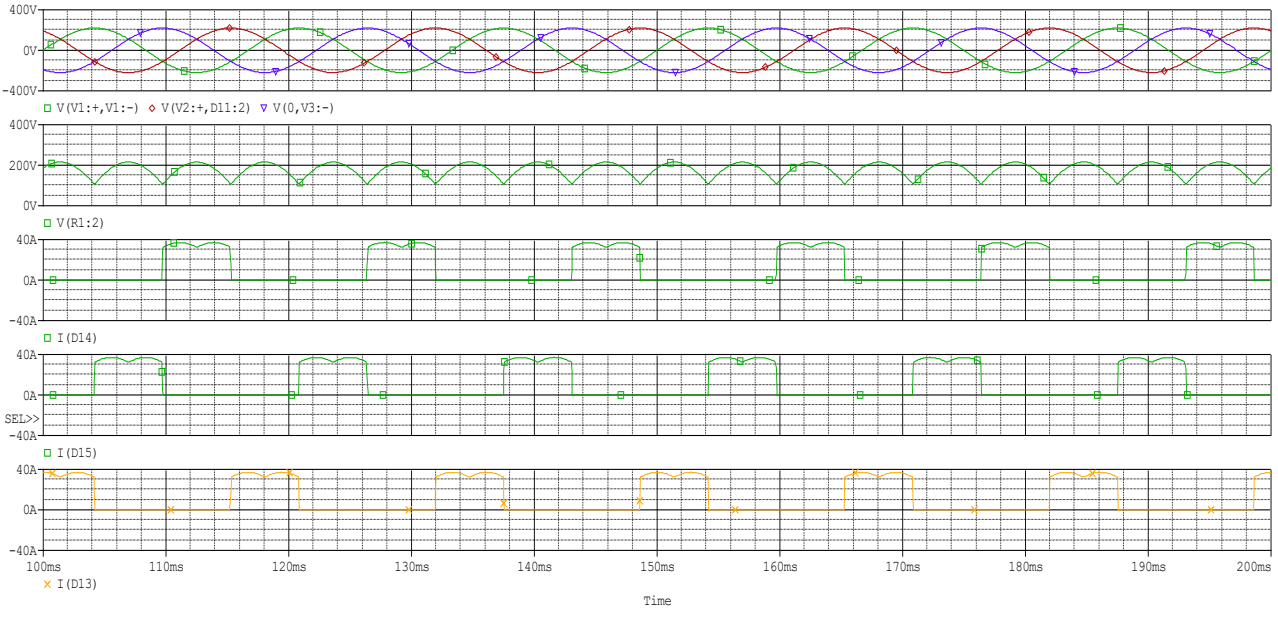
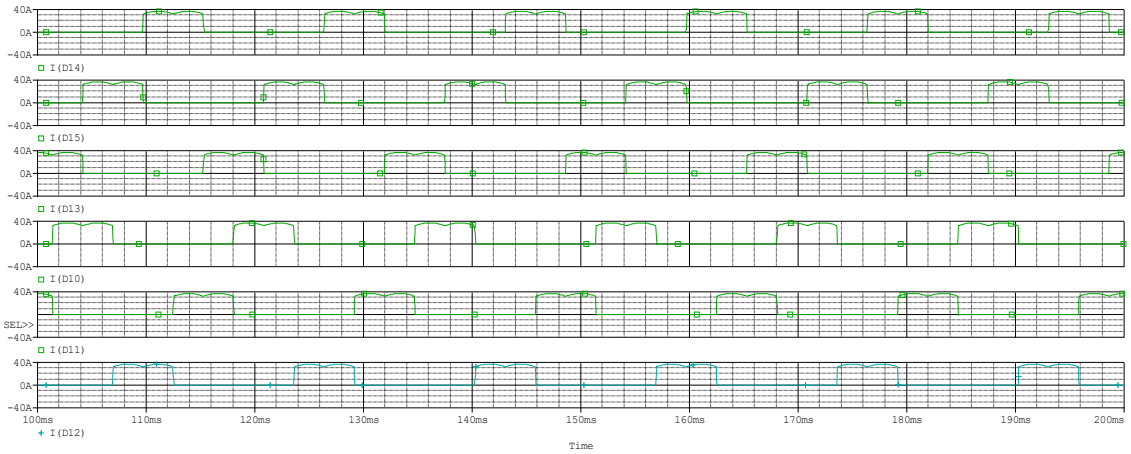


Figure 1: Three-phase full-wave diode rectifier with R Load

b)Output





c)Result

This experiment successfully demonstrated the operation and advantages of a three-phase full-wave rectifier with a resistive load. The circuit efficiently converted three-phase AC input into a smoother DC output, showcasing significant improvements over single-phase alternatives. Key observations included a higher output frequency of 6f (where f is the input frequency), substantially lower ripple content in the output voltage, and improved transformer utilization. We also get higher average DC.

Task 7
Three-phase Full-wave diode rectifier with RLC load.C is parallel to series combination of L and R

a)Schematics

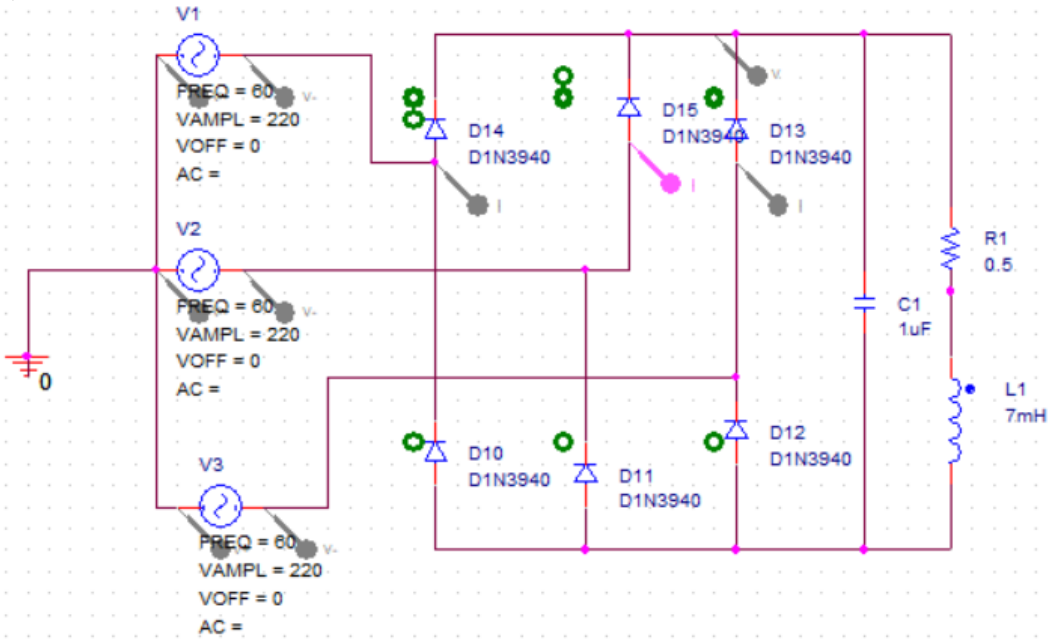
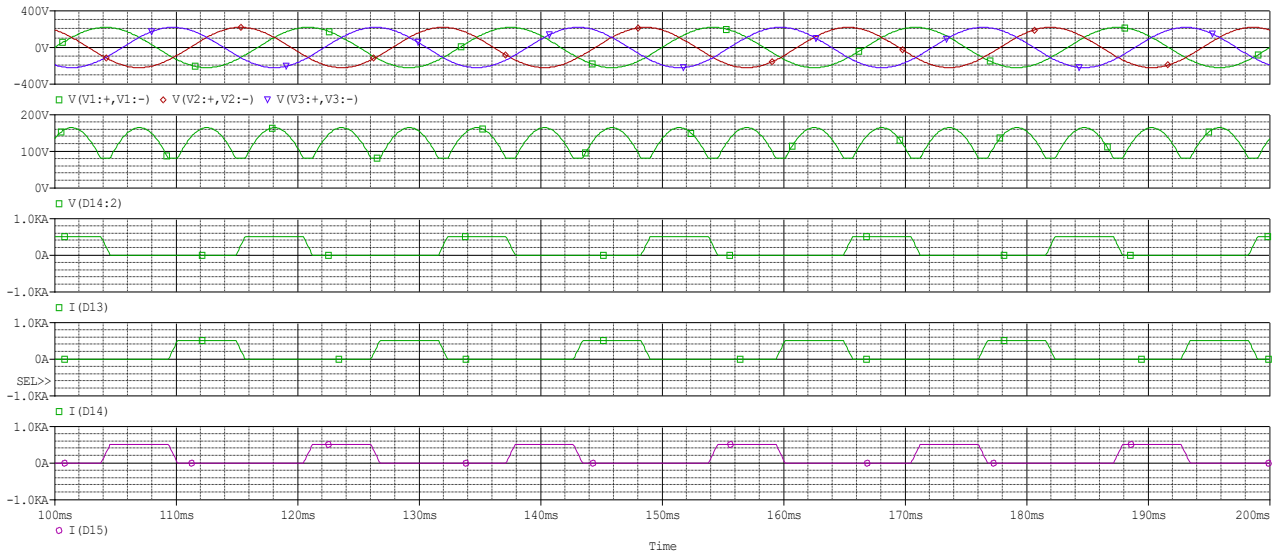


Figure 1: Three-phase full-wave diode rectifier with RLC Load

b)Output



c)Result

The results of the three-phase full-wave diode rectifier with RLC load demonstrate efficient AC to DC conversion with significantly reduced ripple compared to single-phase systems. The output waveforms show a smoother voltage and current profile, with the current exhibiting even less fluctuation due to the inductive component of the load. This configuration achieves a higher output frequency and improved power quality, making it suitable for applications requiring stable DC power from a three-phase source.