

Lab Exercise 5

1. Design a 5V DC power supply circuit using a 230V AC power supply
2. Simulate the power supply design and test the performance of the circuit

Lab Exercise

1. Using the insights gained from the previous four lab exercises, design a 5V DC power supply circuit using an input 230V AC power supply
2. Measure the ripple in the output voltage of the power supply.
3. Test for load regulation: How does the DC power supply vary depending on the variation in the load. Keep the input rms voltage of the AC power supply fixed at 230V.

S.No	R _{LOAD} [Ω]	I _{load} [A]	P _{load} [W]	I _{source} [A]	V _{source} [V]	P _{source} [W]	Efficiency (%)
	SHORT				230		
					230		
	OPEN				230		

4. Test for line regulation: Based on the results in the previous table, select the load for which you obtained the maximum efficiency. Then vary the input rms voltage

S.No	R _{LOAD} [Ω]	I _{load} [A]	P _{load} [W]	I _{source} [A]	V _{source} [V]	P _{source} [W]	Efficiency (%)
	FIXED				230 +5%		
					230 + 10%		
					...		
					...		
	FIXED				230 + 30%		

5. Insert a switch in series to the AC power supply. Alternately, multiple the AC power supply with a unit step function. Now the DC power supply circuit will have a transient response followed by a steady state output response of the 5V output. Measure the transient response time at the output of the DC power supply. What is the peak voltage of the transient response at the output of the DC power supply?
6. Perform Fourier transform of the output time-domain signal. Measure the amplitude in dB and the frequency of the first five peaks of the output waveform.
7. Remove the switch that was inserted in step 5 and repeat the frequency domain analysis that was conducted in the previous step.