3-PHASE UNCONTROLLED RECTIFIER

Circuit Simulation done by

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Theory

Single phase rectifiers are mostly used to supply power for low power DC load. These circuits suffer from the problems such as harmonic power loss and reduced efficiency. Due to these disadvantages and to supply power to DC load with high power ratings, 3-phase rectifiers are used. 3 phase rectifiers produce less ripple output voltage and current compared to single phase rectifiers. The efficiency of 3 phase phase rectifier is also higher.

A 3-phase rectifier circuit consists of six diodes. They are named as D_1, D_2, D_3, D_4, D_5, D_6. For continuous conduction, one diode from the top group (D_1, D_3 and D_5) and one diode from the bottom group (D_2, D_4 and D_6) must be conducting at a time. No diode in the same leg must conduct altogether at a time. Thus the diode rectifier has six different conduction modes. They are D_1D_2, D_2D_3, D_3D_4, D_4D_5, D_5D_6 and D_6D_1. Each conduction mode lasts for $\pi/3$ rad and each diode conducts for 120º.

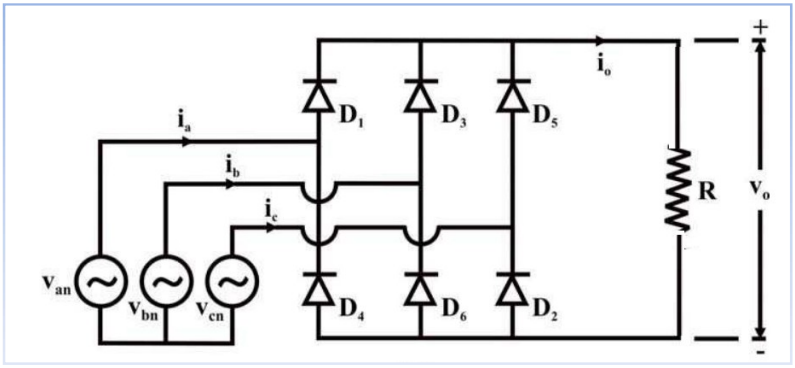

Figure 1: Circuit diagram of 3 phase uncontrolled rectifier

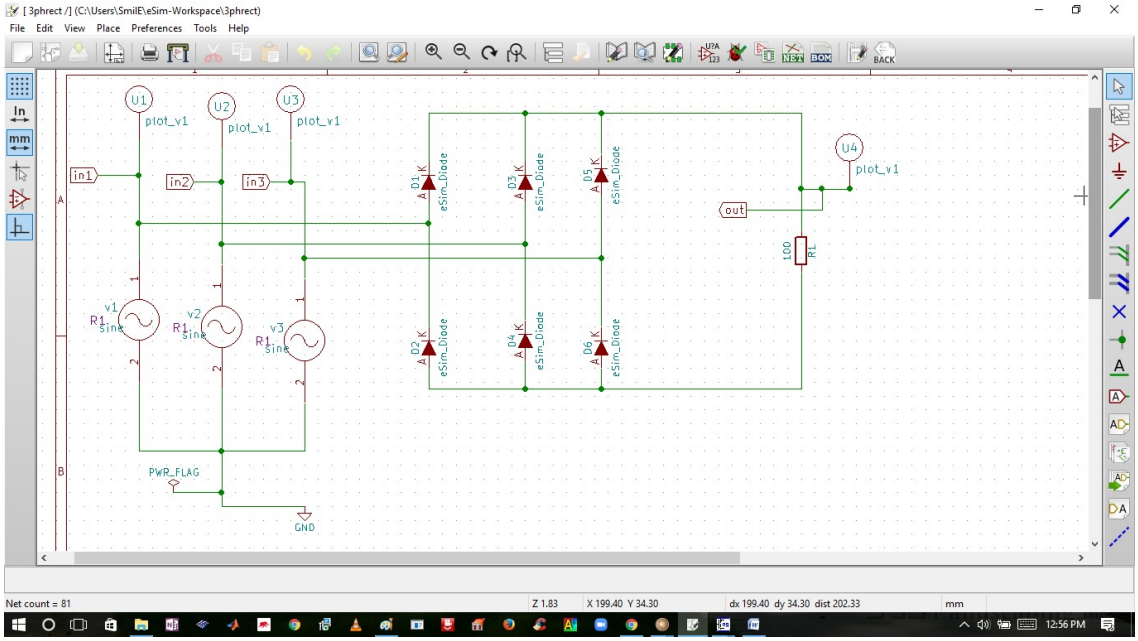

Figure 2: Schematic view of 3 phase uncontrolled rectifier in e sim

Simulation results

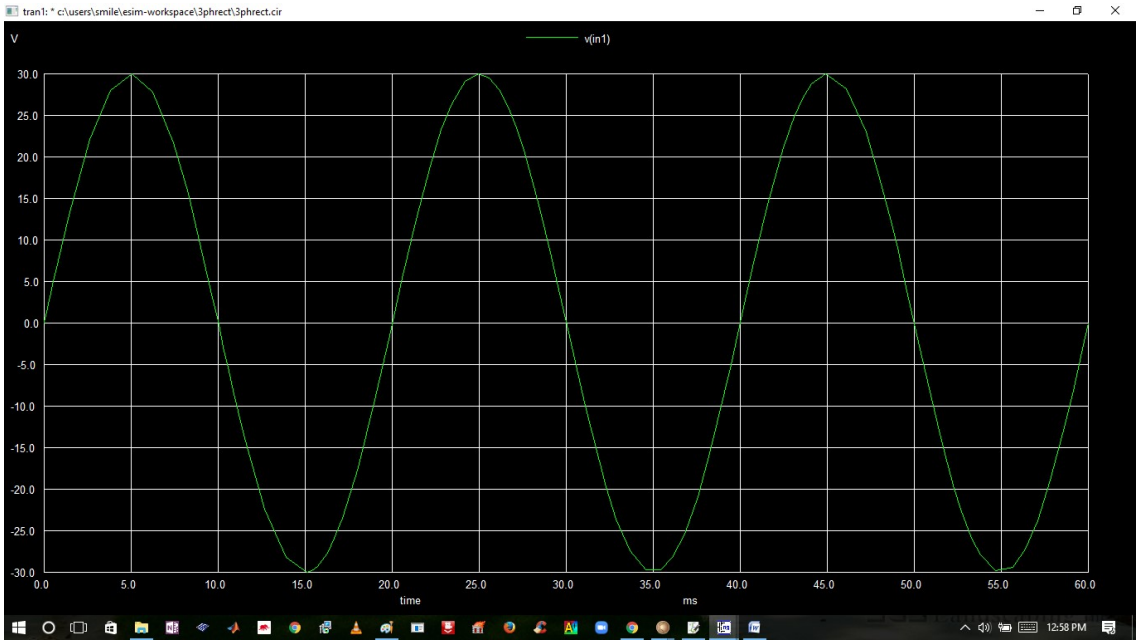

Figure 3: AC input with 0^{o} phase shift (R phase)

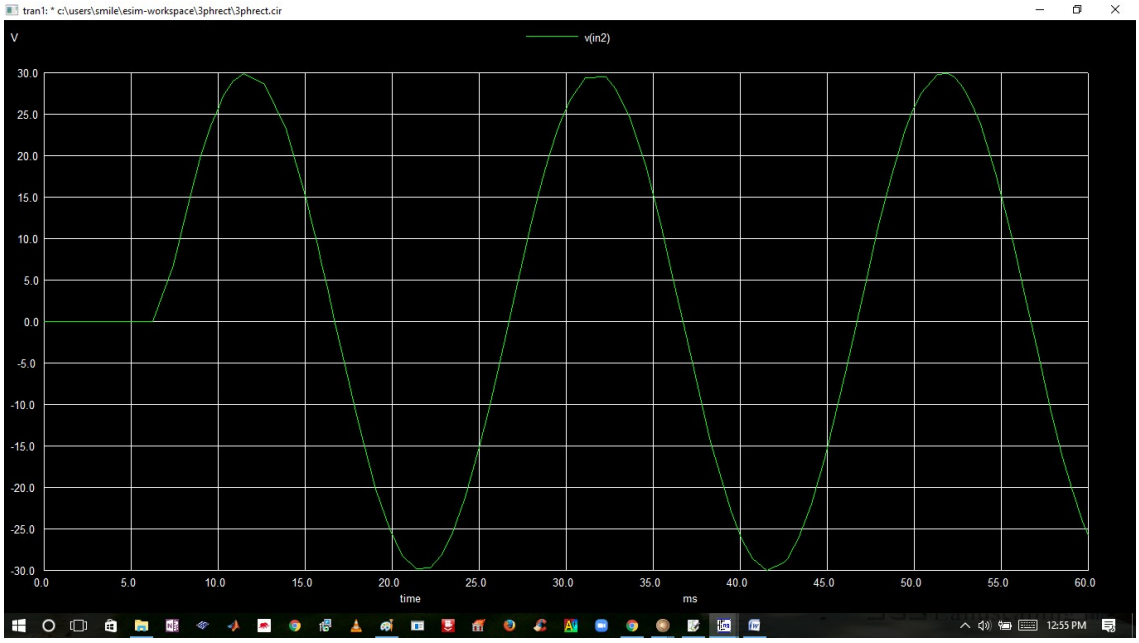

Figure 4: AC input with 120^{o} phase shift (Y Phase)

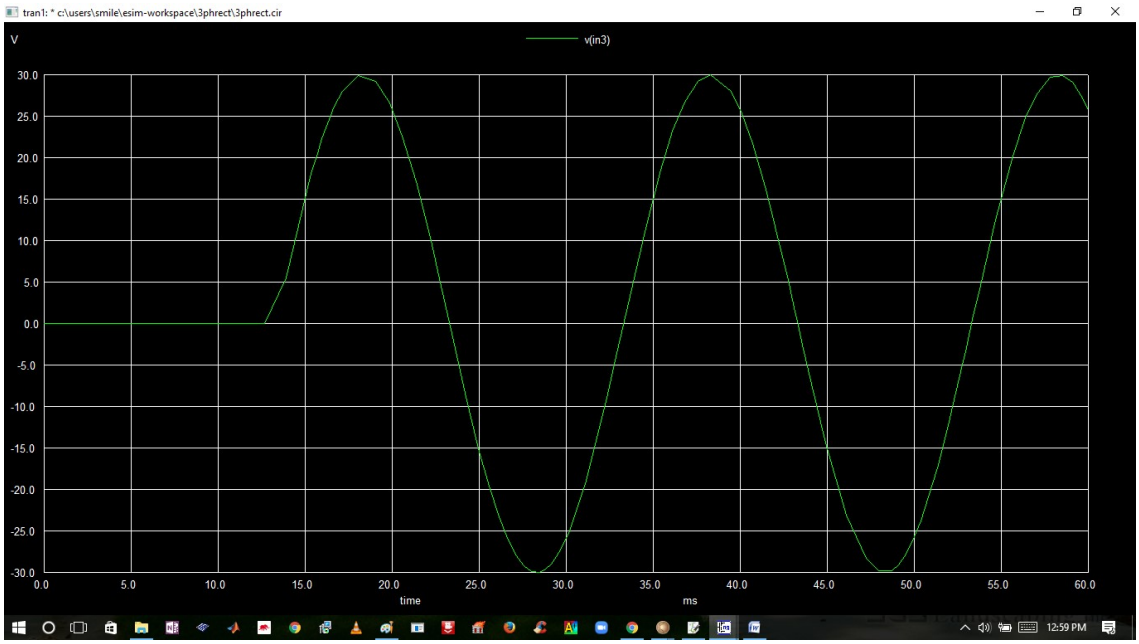

Figure 5: AC input with 240^{o} phase shift (B Phase)

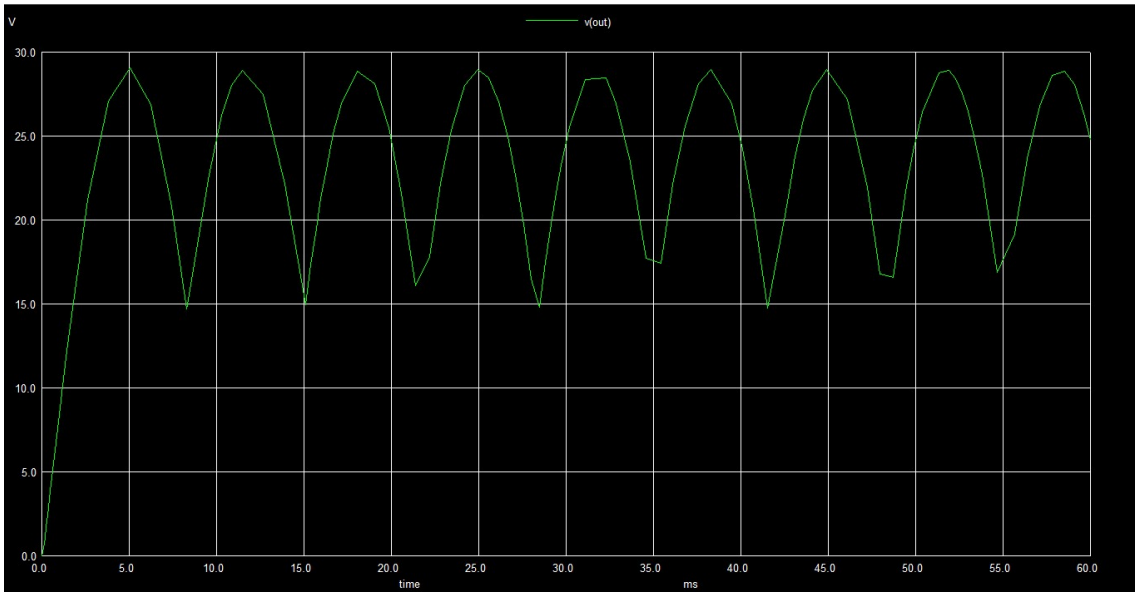

Figure 6: DC output available at the load resistor

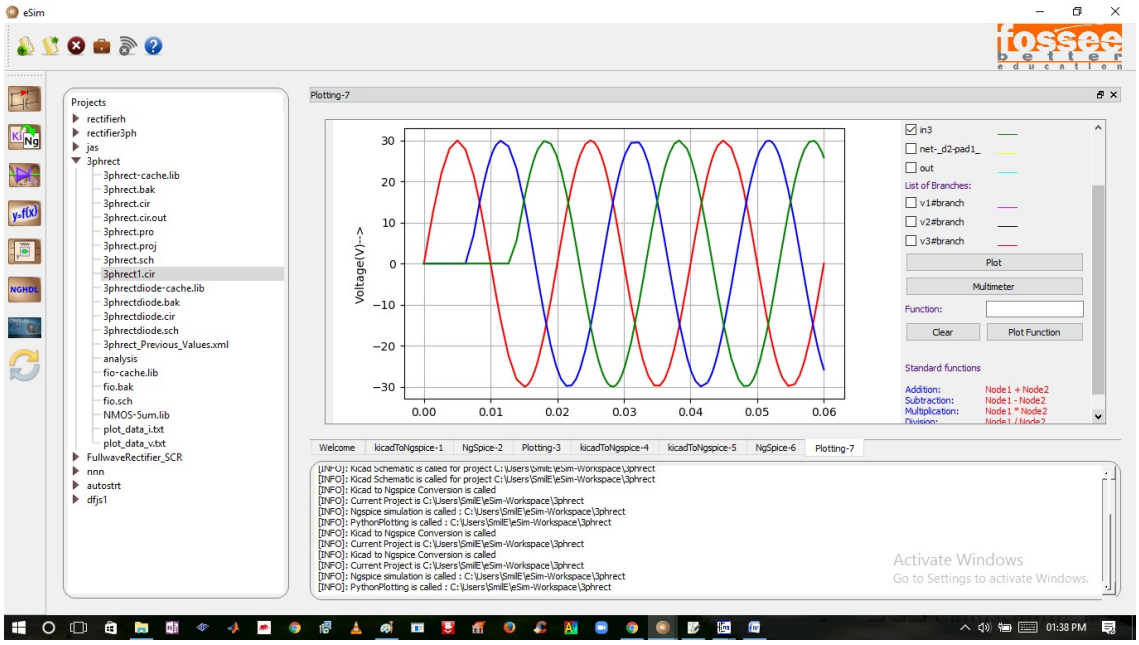

Figure 7: Python plot for 3 phase AC supply

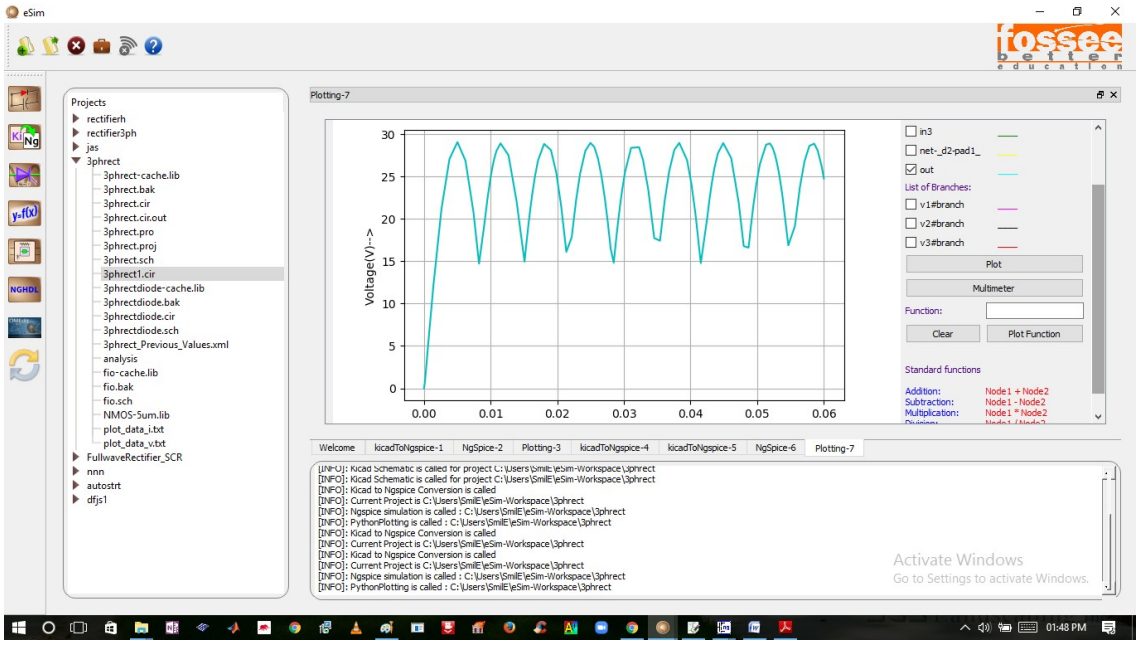

Figure 8: Python plot for DC output available at the load resistor

References

https://ceng.tu.edu.iq/eed/images/PE_lect7.compressed.pdf, (Dr.Arkan A.Hussein, Lecture notes on Power Electronics)