Circuit Simulation Project

https://esim.fossee.in/circuit-simulation-project

Name of the participant: Sahana D V

Title of the circuit: Three Phase Full-wave Rectification with R Load

Theory/Description:

The full-wave three-phase uncontrolled bridge rectifier circuit uses six diodes, two per phase in a similar fashion to the single-phase bridge rectifier. A 3-phase full-wave rectifier is obtained by using two half-wave rectifier circuits. The advantage here is that the circuit produces a lower ripple output than the previous half-wave 3-phase rectifier as it has a frequency of six times the input AC waveform.

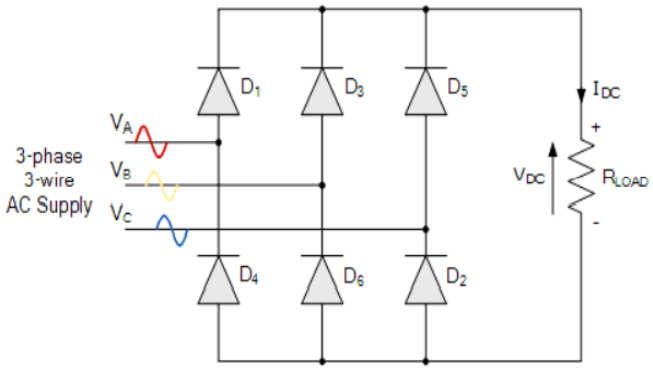
Thus diodes D1 D3 and D5 feed the positive rail and depending on which one has a more positive voltage at its anode terminal conducts. Likewise, diodes D2 D4 and D6 feed the negative rail and whichever diode has a more negative voltage at its cathode terminal conducts.

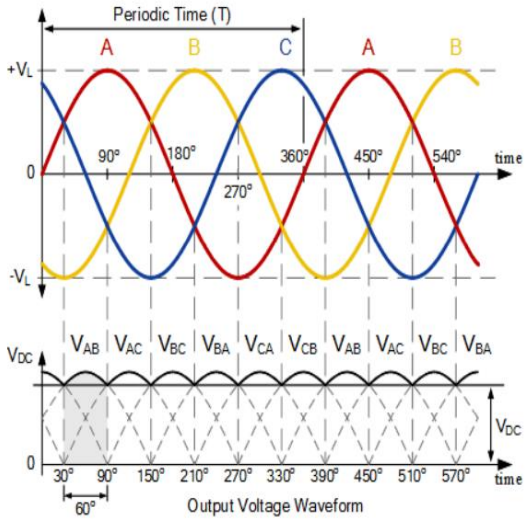
Diodes D1, D3 and D5 are positive diodes and D2, D4 and D6 are negative diodes. Thus naturally in $D_{1\text{-}6}$, $D_{1\text{-}2}$, $D_{3\text{-}2}$, $D_{3\text{-}4}$, $D_{5\text{-}4}$, $D_{5\text{-}6}$ fashion. No two diodes of the same branch conduct simultaneously as that would short the circuit the source.

Each diode conducts for 120^0(one third) of supply cycle, but as it conducts in pair. They conduct for only 60^0(one sixth) of the cycle. As there is on common connection between rectifier input and output terminals, they can be fed by star or delta connected supply.

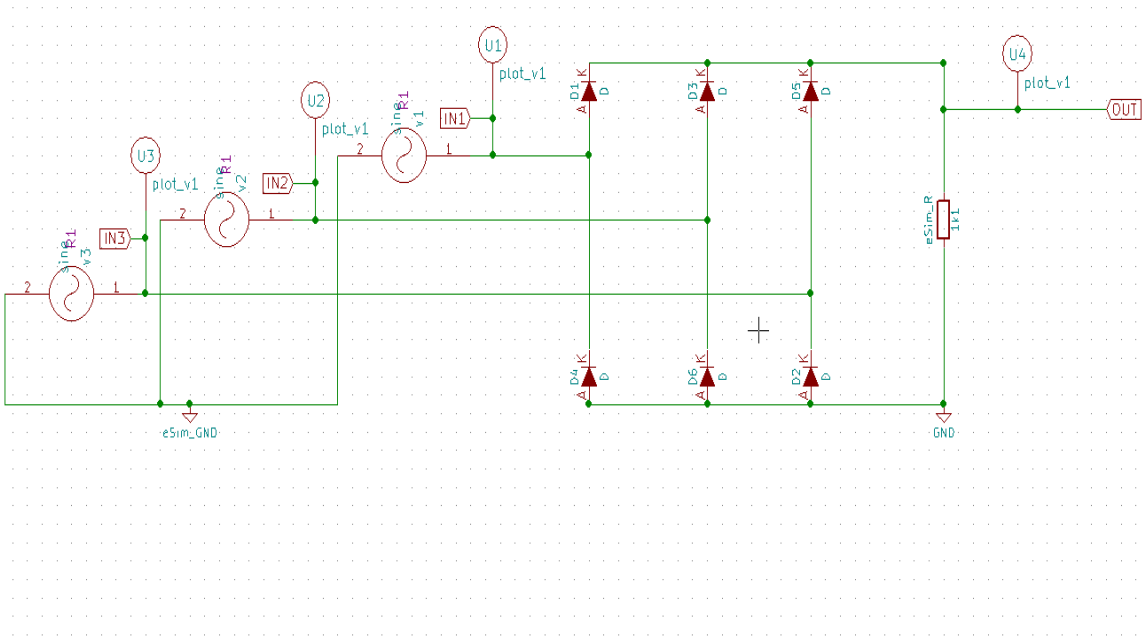
Average DC value of output,

$$V_{DC} = (3\sqrt{3})/\pi \, V_S = 1.65V_s$$





Circuit Diagram(s):



Results (Input, Output waveforms and/or Multimeter readings) :

1. **Ng-Spice Plot:**

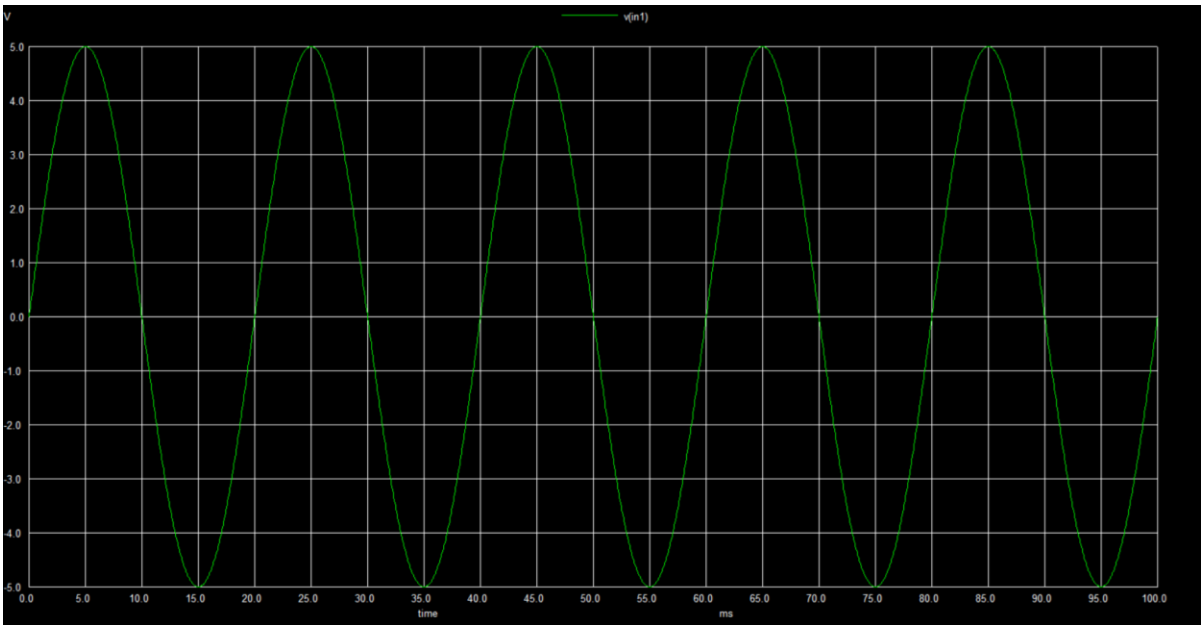


Figure 1-Input voltage 1 with zero delay time.

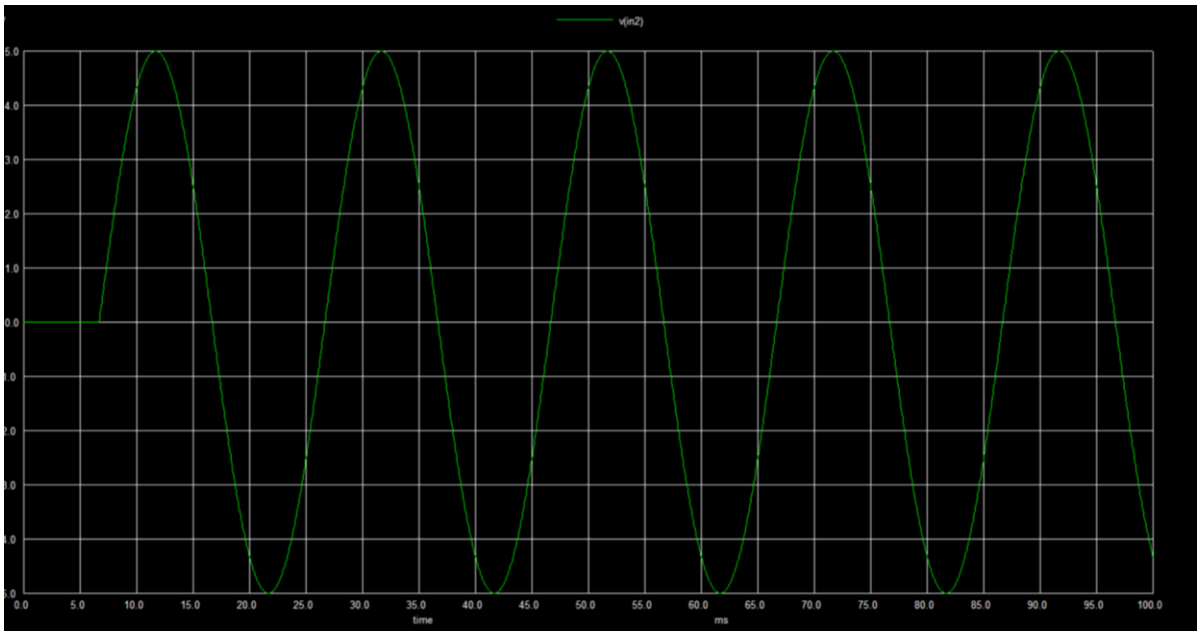


Figure 2-Input voltage 2 with 0.00667 delay time.

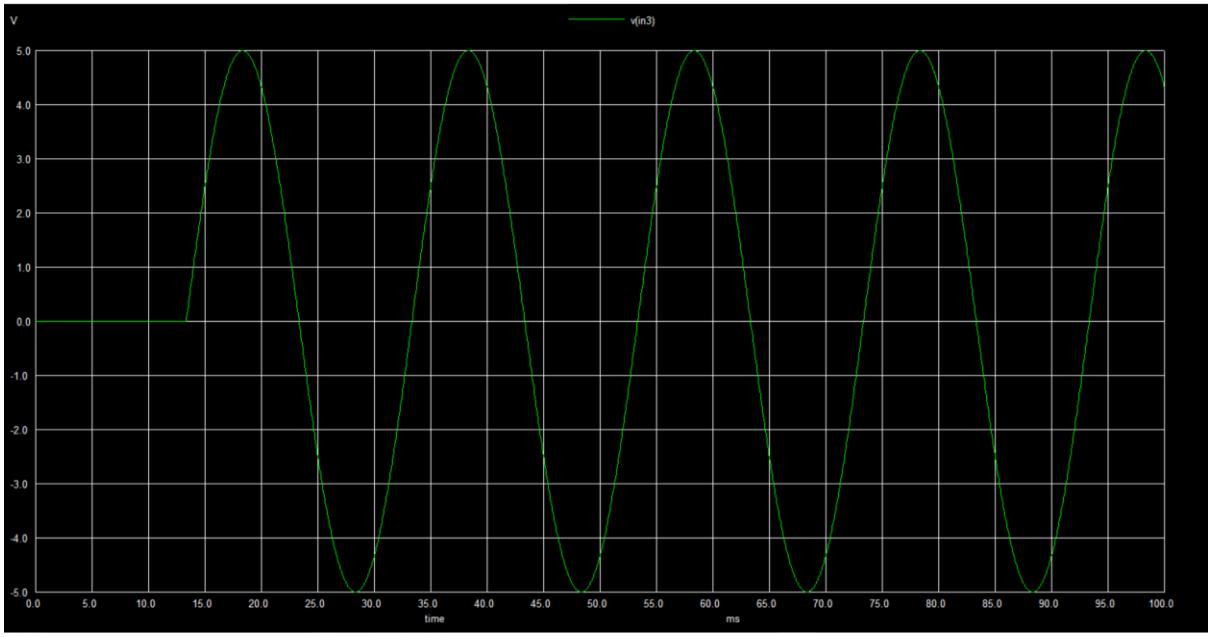


Figure 3-Input voltage 3 with 0.01333 delay time

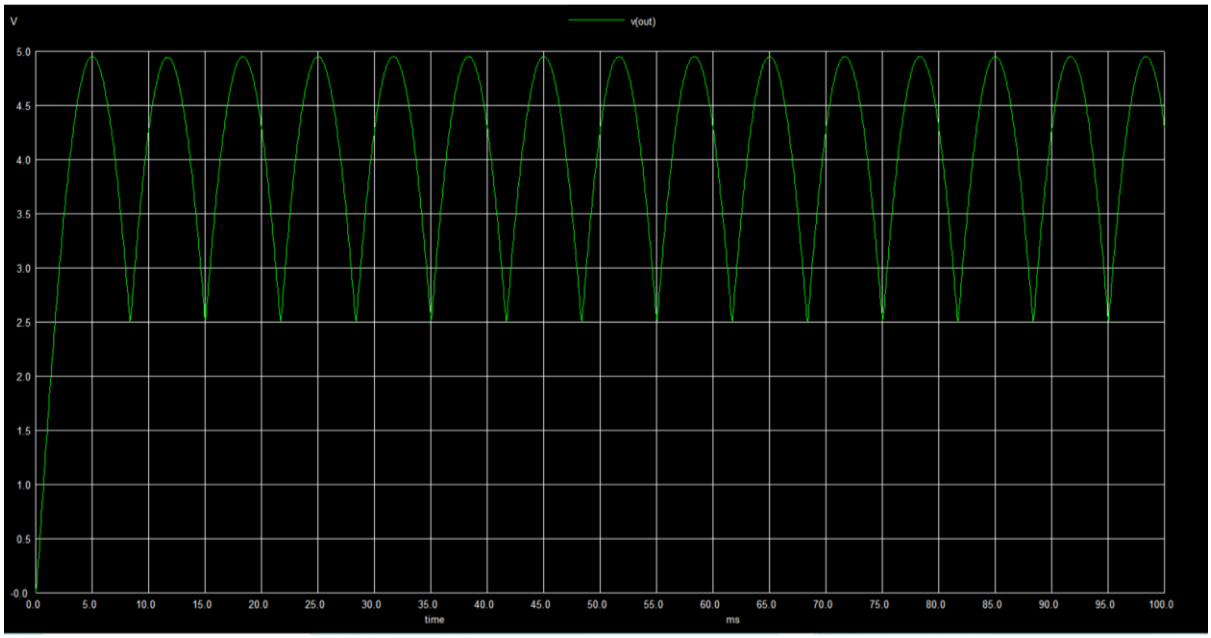


Figure 4-Output rectified voltage

2. **Python Plot:**

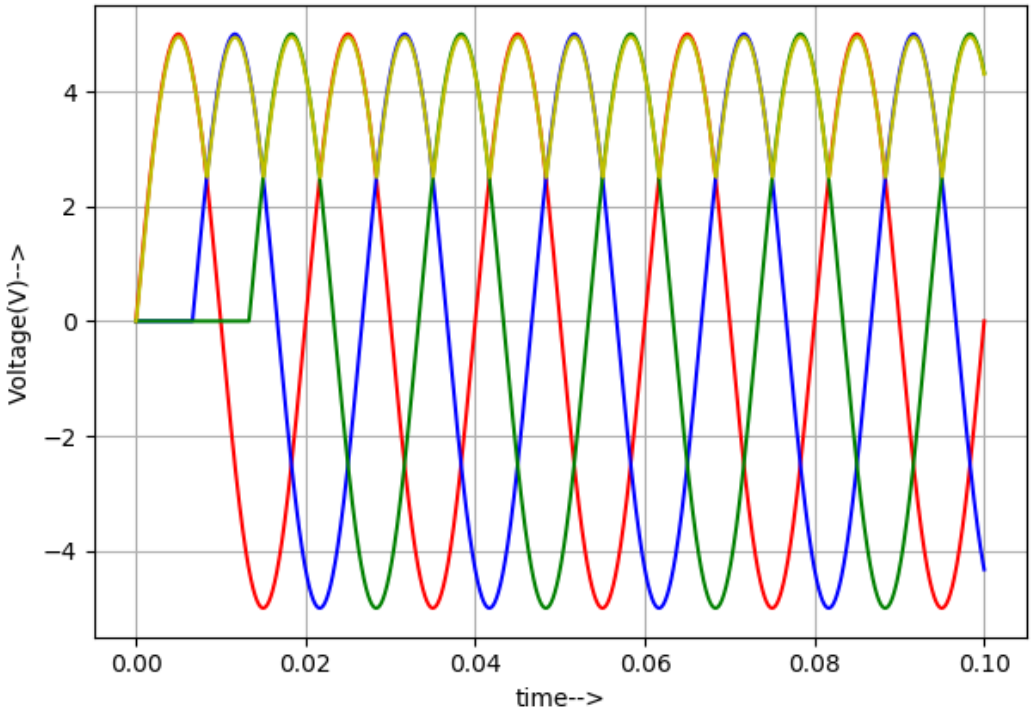


Figure 5-Output rectified voltage and three phase supply

Source/Reference(s) :

1. https://ceng.tu.edu.iq/eed/images/PE_lect7.compressed.pdf
2. https://www.electronics-tutorials.ws/power/three-phase-rectification.html