Research Migration Project

https://esim.fossee.in/research-migration-project

The Research Migration Project is an initiative of FOSSEE, IIT Bombay that promotes the use of eSim for reproducing published research circuits originally implemented using proprietary simulation tools. The objective is to migrate these validated designs to eSim to build an open source resource database and imaginary or self designed circuits are not permitted.

Name of the participant : (Digambar praksh wagholikar)

Affiliation / Institution : (Department of Electrical Engineering (3rd Year),
Shri Guru Gobind Singhji Institute of Engineering and Technology (SGGSIE&T),
Vishnupuri, Nanded, Maharashtra, India)

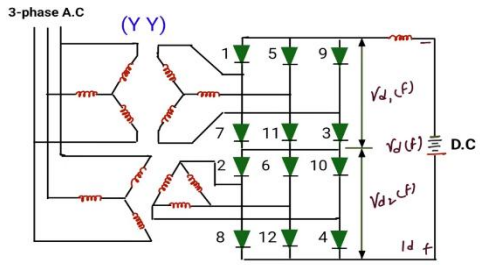
Title of the circuit : (**A three-phase 12-pulse controlled rectifier** uses thyristors to convert AC power into a controlled DC output with reduced ripple and lower harmonic distortion. By phase-shifting two 6-pulse bridges, it improves DC smoothness, power factor, and efficiency in high-power applications..)

Theory/Description : **(A three-phase 12-pulse controlled rectifier converts AC power into a controlled DC output using two 6-pulse thyristor bridges with a 30° phase shift. This arrangement reduces harmonics and output ripple, giving smoother DC voltage and better power factor. It is commonly used in high-power industrial and drive applications.)**

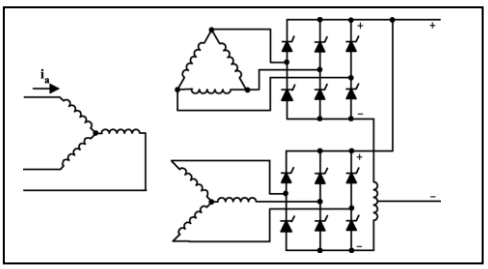
Reason to reproduce with eSim : (Reason to Participate Using eSim:
I have already participated in a marathon and won in the Excellent category. This experience motivated me to contribute more and improve my learning using eSim, as it is efficient and easy to understand. I want to further enhance my skills and learn more about eSim through this participation..)

Expected Outcome/outputs : **(After simulation, the expected outcome is a pulsating DC output waveform, which confirms the correct operation of the rectifier. The simulation helped in understanding the rectification process; however, there was confusion while setting the parameters, which affected the ease of obtaining a smooth and accurate output. This experience highlighted the importance of proper parameter selection and improved my understanding of the simulation process.)**

Circuit Diagram(s) :



Block Diagram (s) :



Expected Results (Input, Output waveforms and/or Multimeter readings) : Input: Three-phase AC supply of 50 Hz applied to a phase-shifting transformer with 30° phase difference.

Output:

A pulsating DC voltage with 12 pulses per cycle, having reduced ripple. The DC voltage level varies with the thyristor firing angle, as observed on the DC voltmeter during simulation.

Research Paper/Journal/etc. : (This paper explains the operation of **12-pulse controlled rectifiers** and analyzes how the **DC output voltage varies with thyristor firing angle**, which matches the simulation results observed using a DC voltmeter.)

Title : (Effects of Firing Angle Imbalance on 12-pulse Rectifiers with Interphase Transformers)
Author : (David J. Perreault and John G. Kassakian)
Page No. : (1075–1080)
Link : (https://per.mit.edu/wp-content/uploads/2024/02/cpPESC93p1075.pdf)

Source/Reference(s)(Power Electronics by M. D. Singh and K. B. Khanchandani)

Note: Fields marked with an asterisk (*) are mandatory and must be filled for successful submission.