Kafrelsheikh University, Faculty of Engineering
Electrical Engineering Department

FINAL EXAM - First Term - 2020/2021

Course	Power Electronics (1)	Date	10-3-2021
Code	EPM3108	Time	3 hours
Students	3rd Year Electrical Power Engineering	Mark	90

This exam measures the ILOs: a.1, a.5, a.11, a.13, b.1, b.2, b.3, b.4, b.6, b.5, c.2, c.4, c.6, d.1, d.3, d.6, d.7, d.8

Answer the following FOUR questions: Draw the circuit diagrams and necessary waveforms and write the necessary equations to clarify your answer. Assume any missed data

Question 1 (20 Marks):

a) Explain and draw the construction and characteristics of thyristor at different gate signals.

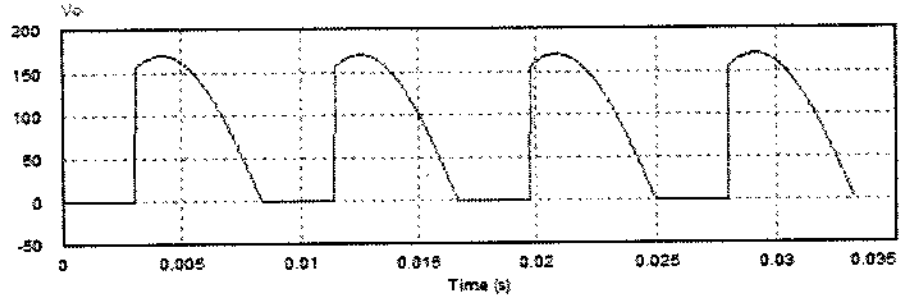
b) Define the commutation of thyristors. What are the types of commutation? Explain in detail TWO of the commutation methods.

Question 2 (40 Marks):

Explain the principle of operation of each of the three-phase full-wave uncontrolled and controlled rectification. Your answer must include a) circuit diagrams, b) output voltage and source current waveforms, c) phase voltages equations, d) line voltages equations and e) derivation of average and RMS output voltage equations. Consider each of: $\alpha=\pi/3$, $\alpha=\pi/2$ and $\alpha=\pi/4$.

Question 3 (15 Marks):

A single-phase full-wave controlled rectifier with resistive load of 11 Ω. The output voltage waveform is shown below. If this rectifier is used to charge a battery (with E=46 Volt) through the resistive load: (a) Draw the waveforms of output voltage and source current versus ωt, (b) Calculate the average and rms values of output voltage.



Question 4 (15 Marks):

Design LC filter so that the ripple factor of output voltage is 10 %. The filter is used to reduce the ripple content of the output voltage for a single-phase full-wave uncontrolled rectifier. The load resistance is R=25 Ω, load inductance is L=8 mH, and source frequency is 60 Hz.

Best Wishes

Dr. Hany Ahmed Abdelsalam