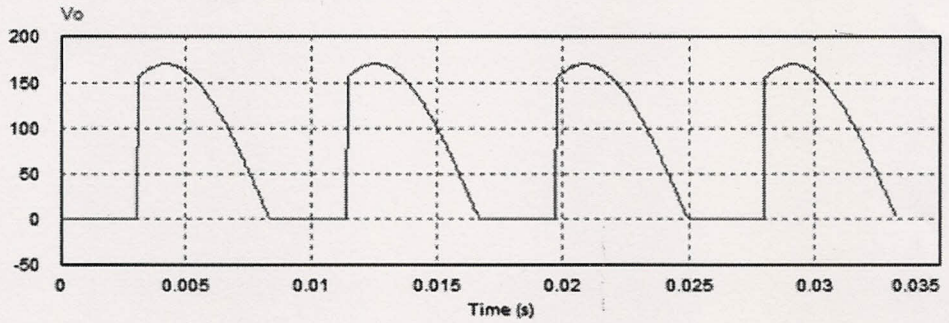
Kafrelsheikh University, Faculty of Engineering Electrical Engineering Department FINAL EXAM			
Course	Power Electronics (1)	Date	13-1-2019
Code	EPM3108	Time	3 hours
Students	3rd Year Electrical Power Engineering	Mark	90

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 One (30 Marks):

A single-phase full-wave controlled rectifier with resistive load of 10 Ω. The output voltage waveform is shown below. If this rectifier is used to charge a battery (with E=40 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, (c) Explain in details how to change the firing angle using the closed-loop feedback control concept.



Question Two (20 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=40 Ω, load inductance is L=10 mH, and source frequency is 50 Hz.

Question Three (20 Marks):

How is the sinusoidal PWM control working? Show analytically using Fourier analysis that the sinusoidal PWM control can eliminate the low order harmonics of source current for a full-wave controlled rectifier with motor load. Consider 6 pulses for each π. Draw the spectrum diagram until the 13th harmonic. If the number of pulses per π is decreased to 4 pulses, Draw is the expected spectrum diagram?

Question Four (20 Marks):

Explain the principle of operation of three-phase full-wave uncontrolled rectification. Your answer must include: a) circuit diagram, b) output voltage waveform, c) phase voltages equations, d) line voltages equations and e) average and RMS output voltages.

Best Wishes

Dr. Hany Ahmed Abdelsalam