



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering.

Lecturer : Prof. Yasser Gaber.

Course : Power Electronics I

Marks : 40

Course Code : EE421

Time : 2 hours

Date : 3/6/2015

Answer all the following questions: (Final Exam)

**Q1.** a. Derive an expression for the instantaneous current of the single phase half wave uncontrolled rectifier connected to R-L load?,  
Draw the equivalent circuit diagram, and sketch the output current and output voltage waveforms?  
Explain why the extinction angle of this circuit exceeds  $180^\circ$  and suggest a way to make the instantaneous output voltage always positive?

b. For the same circuit above, the supply voltage = 200V (peak), frequency = 50Hz, extinction angle ( $\gamma = 210^\circ$ ) & the instantaneous value of the current at  $180^\circ$  equals to 5A; Calculate the value of the load resistance and inductance?  
(ILO: A4) (10 marks)

**Q2.** a. Discuss the I-V characteristics for both diodes and thyristors in details?

b. A three phase controlled full wave bridge rectifier is connected to a resistive load of  $100 \Omega$  while the delay angle equals  $60^\circ$ . The input maximum phase voltage is 200V.  
✓ Sketch the circuit diagram?  
✓ Draw the output voltage & current waveforms?  
✓ Draw the current in one phase of the supply and in one thyristor.  
✓ Calculate the average voltage?

c. A three phase uncontrolled half wave rectifier connected to a resistive load of  $100 \Omega$  and series with a dc battery of 150 V. The input maximum phase voltage is 200V.  
✓ Sketch the circuit diagram?  
✓ Draw the output voltage & current waveforms?  
✓ Calculate the average output current?  
(ILO: B11)(10 marks)

**Q3.** a. Define power electronics control, state three different applications of it in industry & compare between it and motor/generator set?

b. For a single phase full wave controlled rectifier connected to a resistive load of 50 ohms and high inductive load. The supply is ac with a voltage of 100V. Delay angle equals  $60^\circ$   
✓ Sketch the circuit diagram?  
✓ Draw the output current and voltage waveforms?  
✓ Draw the thyristor voltage waveform?  
(ILO: C29) (10 marks)

**Q4.** a. What is the function of both the capacitor & the inductor in the second order dc link filter for the AC/DC converter? For a single phase full bridge rectifier, draw a circuit diagram to show such circuit?

b. For a three phase full wave controlled rectifier connected to a 200V (phase peak) AC supply, the load contains  $R = 10 \text{ ohms}$  and 2<sup>nd</sup> order dc link filter (high L & high C) & the delay angle =  $30^\circ$ .  
✓ Sketch the circuit diagram?  
✓ Draw the output voltage and current waveform?  
✓ Calculate the average output voltage and current  
(ILO: C20) (10 marks)

*Best Wishes*

Members of course Examination Committee:		Signature:	Date:
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