



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SUPPLEMENTARY EXAMINATION

EED 216: POWER ELECTRONICS

DATE: 31/8/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS:

*This paper consists of **FIVE** Questions. Answer Question ONE and ANY OTHER TWO questions.*

QUESTION ONE (COMPULSORY)

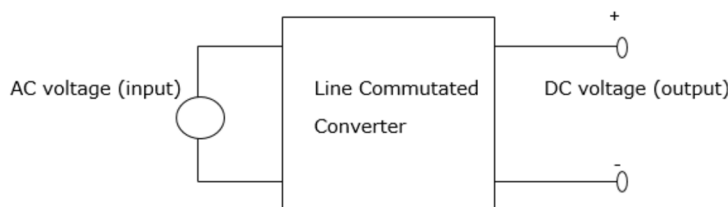
- a) A power electronic system converts electrical energy from one form to another. Explain the significance of this system (6 marks)
- b) With the aid of a schematic diagram, explain how power electronics is used in air conditioners. (11 marks)
- c) Explain the following
 - i. Modes of Operation in SCR
 - ii. ON state (conducting mode)
 - iii. Reverse blocking(9 marks)
- d) It is important to determine the performance parameters for different converters whose topologies can be single phase or multi-phase. Explain the two assumptions of this performance. (4 marks)

QUESTION TWO (20 MARKS)

- a) Highlight five main types of battery chargers and their application in power electronics. (10 marks)
- b) Explain the major Applications of choppers as DC regulators. (6 marks)
- c) Using diagrams explain the application of various types of symbols (4 marks)

QUESTION THREE

- a) A (BJT) emits a current of 1mA, and has emitter efficiency of 0.99. The base transport factor is 0.994 and a depletion layer recombination factor is 0.997. For the BJT calculate the following:
 - i. The transport factor (2 marks)
 - ii. The current gain (2 marks)
 - iii. The collector current (2 marks)
 - iv. The base current (2 marks)
- b) The figure below shows a phase controlled converter converts AC to DC energy (line commutated). Explain its operation (8 marks)



- c) Explain the Applications of The insulated gate bipolar transistor (4 marks)

QUESTION FOUR

- a) With the aid of a well labeled diagram, using a DC to DC converter, explain the concept of resonance switching (8 marks)
- b) An inverter is a power electronic device that converts power in DC form to AC form at the required frequency and voltage output. Explain the two main categories of Inverters. (4 marks)
- c) Explain the difference in application between the following linear circuit elements.
 - i) Sensors
 - ii) Filters
 - iii) Controllers
 - iv) Electromagnetic devices(8 marks)

QUESTION FIVE

- a) The TRIAC structure is regarded as a DIAC having an extra gate contact incorporated to ensure device control. Using a diagram, explain the process of fabricating the silicon leads to the production of a DIAC. (6 marks)
- b) Explain how a TRIAC operation facilitates the switching function in AC electrical components and systems. (8 marks)
- c) Using symbols explain the operation of a BJT (6 marks)