

2014  
B.E. (Electrical and Electronics Engineering)  
Sixth Semester  
EE-606: Power Electronics

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting one question from each Section.

x-x-x

- Q1 (a) What is the primary function of a thyristor in electronic circuits?  
(b) Define the term "gate triggering" in the context of a silicon-controlled rectifier (SCR).  
(c) Which type of semiconductor device is commonly used as a thyristor?  
(d) What is the purpose of a snubber circuit in SCR applications?  
(e) Explain the concept of phase control in phase-controlled rectifiers.  
(f) What is the key advantage of using a full-wave bridge rectifier over a half-wave rectifier?  
(g) How does a unidirectional thyristor differ from a bidirectional thyristor in terms of conduction?  
(h) Name a commonly used type of DC-DC converter and briefly describe its operation.  
(i) What is the significance of the term "commutation" in the context of thyristors?  
(j) How does the duty cycle affect the output voltage in a pulse-width modulation (PWM) DC-DC converter?  
(1\*10= 10)

**Section A**

Q2 Consider a power electronic system where two thyristors are connected in series and another two thyristors are connected in parallel. Each thyristor has a rated voltage of 600V and a rated current of 50A. If the system requires a voltage handling capability of 1200V and a current handling capability of 100A, propose a suitable configuration (series, parallel, or a combination) for the four thyristors to meet these requirements. Provide calculations and explanations for your choice. (10)

Q3 (a) Explain the concept of commutation in the context of an SCR. Discuss the importance of commutation in SCR circuits. (4)

(b) Describe two common methods used for commutation in SCR circuits. Compare and contrast the advantages and disadvantages of each method. (6)

Q4 a) Explain the significance of protecting thyristors in electronic circuits. Discuss the potential risks and consequences of not having adequate protection. (4)

b) Describe two common protection circuits used for thyristors, highlighting their principles of operation. Discuss how each circuit protects against specific faults or overloads. (6)

**Section B**

Q5 Draw the working of a single phase full wave controller converter. In what respects is the operation of this circuit different for resistance load, R-L load and RLE load? (10)

Q6 Explain with the help of proper diagrams the function of a three-phase full-wave fully controlled bridge inverter for 180° conduction. (10)

P.T.O

(2)

Q7 Consider a buck chopper circuit designed to step down a 120V DC source to a 90V output for a resistive load. The chopper operates with a duty cycle of 0.6.

a) Calculate the ON time and OFF time of the chopper in microseconds. (4)

b) Determine the average output voltage of the chopper. (3)

c) If the load resistance is 10 ohms, calculate the average output current. (3)

x-x-x