



**ST. ANNE'S**  
**COLLEGE OF ENGINEERING AND TECHNOLOGY**  
ANGUCHETTYPALAYAM, PANRUTI – 607106.

**QUESTION BANK**

**DECEMBER 2017 - JUNE 2018 / EVEN SEMESTER**

**BRANCH: EEE**

**YR/SEM: II/IV**

**BATCH: 2016 - 2020**

**SUB CODE/NAME: EE 6503 POWER ELECTRONICS**

**UNIT I**

**POWER SEMI-CONDUCTOR DEVICES**

**PART - A**

1. State the condition to be satisfied for the load commutation in SCR. (Nov/Dec- 2011)
2. Define turn off time of SCR (Nov/Dec- 2011)
3. Draw the turn-on characteristics of TRIAC and mark the timings  $t_d$ ,  $t_r$  and  $t_{on}$ . (Nov/Dec- 2010)
4. What are the factors that influence the turn-off time of a thyristor? (Nov/Dec- 2010)
5. What are the drawbacks of GTO? (Nov/Dec- 2012)
6. What is latching current of SCR? (Nov/Dec- 2012)
7. List various forced commutation techniques used to turn off SCR. (Nov/Dec- 2013)
8. What is the snubber circuit? (Nov/Dec- 2013)
9. Define latching and holding current. (May/ June- 2014)
10. Compare power MOSFET and BJT(May/ June- 2014)
11. What is meant by current commutation of SCR? (Nov/Dec- 2014)
12. Distinguish between SCR and TRIAC. (Nov/Dec- 2014)
13. Differentiate SCR and power transistor (April/ May-2015)
14. What is an IGBT (April/ May-2015)
15. Draw TRIAC characteristics. (April/ May-2015)
16. Draw switching time characteristics of BJT. (April/ May-2015)
17. What are called switching devices? (Nov/ Dec-2016)
18. Draw a neat sketch of Turn- on characteristics of SCR. (Nov/ Dec-2016)
19. Specify the basic features of IGBT. (Nov/Dec-2016)
20. What is the purpose of using snubber circuit? (Nov/Dec-2016)
21. Define Holding current.and Latching current in SCR. (May/ June- 2016)
22. Draw the two transistor model of SCR. (May/ June- 2016)
23. What is meant by commutation of SCR and list its types? (April/May-2017)
24. What are the advantages of GTO over SCR? (April/May-2017)
25. What is meant by commutation of a SCR? (April/May-2018)
26. Mention the advantages of 'RC' triggering over 'R' triggering. (April/May-2018)
27. Why IGBT is very popular nowadays? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
28. What are the different methods to turn on the thyristor? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
29. What is the difference between power diode and signal diode? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
30. IGBT is a voltage controlled device. Why? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
31. Power MOSFET is a voltage controlled device. Why? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
32. Power BJT is a current controlled device. Why? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
33. How can a thyristor turned off? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
34. Define latching current. ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
35. Define holding current. ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))
36. What is a snubber circuit? ([www.Vidyarthiplus.com](http://www.Vidyarthiplus.com))

37. What losses occur in a thyristor during working conditions? (www.Vidarthiplus.com)
38. Define circuit turn off time. (www.Vidarthiplus.com)
39. What are the advantages of GTO over SCR?
40. What is meant by phase controlled rectifier?
41. Mention some of the applications of controlled rectifier.

## **PART – B**

### **SCR**

1. Explain the structure and operation of turn ON and turn OFF characteristics of SCR. (May/June-2016), with neat sketch explain the turn on and turn off characteristic of SCR (Nov/Dec-2011), Draw the turn-off characteristics of SCR and explain the mechanism of turn-off. (8) (Nov/Dec- 2010), Draw the turn-off characteristics of SCR and explain the mechanism of turn-off. (8) (16) (Nov/Dec- 2015)
2. Discuss different turn-on methods of SCR with its turn on characteristics. (Nov/Dec- 2014)
3. What are the different methods for turning off an SCR? Explain all methods in detail. (Nov/Dec-2010)
4. Draw and explain switching characteristics of SCR (8) (Nov/Dec- 2013)
5. Explain the operation of SCR using two transistor analogy. (10) (May/ June- 2014)
6. Briefly explain the VI characteristics of SCR (6) (May/ June- 2014)
7. Discuss the two transistor model of a thyristor. Derive an expression for the node current. Explain the turn on characteristics of a thyristor. (April/ May- 2015)
8. Explain the construction and switching characteristics of SCR (April/ May- 2017)
9. Draw and explain the switching characteristics of a thyristor. (Nov/Dec-2016)
10. Explain the operating principle of a thyristor in terms of the two transistor analogy. (May/ June- 2016)

### **BJT**

11. Explain the switching performance of BJT with relevant waveform indicating clearly the turn ON and turn OFF times and their component. (May/ June- 2016)

### **MOSFET**

12. Discuss the operation of power MOSFET and explain the transfer, output and switching characteristics of power MOSFET. (May/ June- 2016), Explain the switching characteristics of power MOSFET (8) (May/ June- 2014)
13. Explain with diagram the various modes of working of TRIAC (May/ June- 2016)
14. Discuss the static and switching characteristics of IGBT and MOSFET. (Nov/Dec- 2014)
15. Compare and contrast the performance characteristics of SCR and MOSFET (8) (Nov/Dec- 2012)
16. Briefly explain about power MOSFET protection circuit. (8) (May/ June- 2014)
17. (i) Explain the operating principle of MOSFET. (Nov/Dec- 2016)
18. (ii) Explain the driver and snubber circuit for MOSFET. (Nov/Dec- 2016)
19. Describe about any one Driver and Snubber circuit for MOSFET. (April/ May- 2017)

### **IGBT**

20. Explain the operation of IGBT with the help of neat structural diagram and suitable wave forms. (16) (Nov/Dec- 2010), Describe the basic structure of IGBT and explain its working. Give its equivalent circuit and explain the turn ON and turn OFF processes. (Nov/Dec- 2013)
21. Discuss in detail the static and switching characteristics of IGBT (16) (Nov/Dec- 2012)
22. With neat diagram and waveform explain the turn on and turn off characteristics of IGBT. (April/ May- 2015)
23. Draw neat diagrams of Driver and snubber circuits of TRIAC and IGBT and explain its working and applications. (Nov/ Dec-2016)

### **TRIGGERING AND COMMUTATION CIRCUIT FOR SCR**

24. Briefly discuss the RC triggering of SCR. (May/ June- 2016)
25. Describe the current commutation technique to turn off the SCR with neat sketch and waveforms. (16) (Nov/Dec- 2011), Discuss in detail about the current commutation method of turn-off. (16) (Nov/Dec- 2015)
26. Discuss any two types of commutation circuits used for SCR in detail. (8) (Nov/Dec- 2012)
27. Discuss the working of a complementary commutation circuit of SCR with neat circuit diagram and waveform. (8) (Nov/Dec- 2013)
28. With neat diagrams, explain the Turn- off characteristics, switching losses and working of commutation circuit of SCR. (Nov/ Dec-2016)
29. Explain the working of a current commutation technique. (April/May-2018)
30. Describe the UJT triggering circuit with neat sketch. (April/May-2018)

### **TRIAC**

31. Explain the structure and different modes of operation with the characteristics of Triac. (16) (Nov/Dec- 2015)
32. Draw neat diagrams of Driver and snubber circuits of TRIAC and IGBT and explain its working and applications. (Nov/ Dec-2016) (repeated in IGBT also)
33. Explain the structure, different modes of operation and characteristics of Triac. (May/ June- 2016)

## **PART – C**

### **UNIT II**

### **PHASE CONTROLLED CONVERTERS**

#### **PART - A**

1. What is meant by phase control? (Nov/Dec- 2014)
2. Why power factor of semiconverter is better than full converter (Nov/Dec- 2014, Nov/Dec- 2014)

3. Compare half controlled rectifier and full controlled rectifier (May/ June- 2014)
4. What is dual converter? Mention its functional mode of operation. (May/ June- 2014)
5. Mention disadvantages of dual converter with circulating current mode of operation. (Nov/Dec- 2013)
6. 2013)
7. What is the inversion mode of rectifiers? (Nov/Dec- 2012)
8. Give any two difference between single phase full converter and semi converter. (Nov/Dec- 2011)
9. 2011)
10. What is meant by line commutated inverter? (Nov/Dec- 2011)
11. Draw the circuit diagram of single phase dual converter. (Nov/Dec- 2010)
12. Define the term voltage ripple factor and current ripple factor. (Nov/Dec- 2010)
13. Mention some of the applications of converter. (Nov/Dec- 2015)
14. What are the performance parameters of phase controlled converters? (Apr/May- 2015)
15. What is the effect of load inductance in three phase fully controlled converters? (Apr/May- 2015)
16. 2015)
17. What is the effect of source impedance on the performance of converter? (Apr/May- 2015)
18. Draw circuit and waveform of ideal dual converter. (Apr/May- 2015)
19. What is the effect of source impedance on the performance of converter? (April/ May-2015)
20. Draw circuit and waveform of ideal dual converter. (April/ May-2015)
21. What is overlap angle? (Nov/Dec- 2015)
22. What is meant by Phase controlled Converters. (Nov/ Dec-2016)
23. Draw a neat sketch of Battery charger. (Nov/ Dec-2016)
24. What are the effects of source inductance? (May/ June- 2016)
25. What are the functions of freewheeling diode? (May/ June- 2016)
26. What is meant by Phase Control? (April/May-2017)
27. What are the roles of freewheeling diode in a controlled rectifier? (April/May-2017)
28. List out the differences between full and semiconverter. (April/May-2018)
29. Give the applications of fly wheel diode in a full converter. (April/May-2018)

## **PART-B**

### **2-PULSE, 3-PULSE AND 6-PULSE CONVERTERS**

1. Describe the working of single phase fully controlled bridge converter in the rectifying mode.
2. And derive the expressions for average output voltage and RMS output voltage. (16) ([www.universityquestions.in](http://www.universityquestions.in)), With a neat circuit diagram and waveforms explain the principle of operation of two quadrant two pulse converter in the rectifying and inverting mode of operation. (10) (Apr/May- 2015),

- Explain with circuit and output waveform working of single phase two pulse fully controlled converter with RL load. (16) (Apr/May- 2015)
3. Describe the working of 3 phase fully controlled bridge converter in the Rectifying mode. And derive the expressions for average output voltage and RMS output voltage. (16) (www.university questions.in), Draw the circuit diagram and explain the operation of three phase fully controlled bridge rectifier feeding R load and derive the expression for average output voltage.(8) (Apr/May-2015)
  4. Derive the expressions for average output voltage and RMS output voltage of three phase semi converter. (16) (www.university questions.in), Explain the operation of three phase semiconverter with neat wave forms ((Nov/Dec-2012), Explain the operation of three phase semi converter with RLE load. Sketch associated waveforms. (www.Vidyarthiplus.com)
  5. Explain the operation of 3 phase 3 pulse converter with R load. Derive for average output voltage. (16) (Nov/Dec-2015)
  6. A single phase full converter is connected with R load. The source voltage is 230V, 50 Hz. The average load current is 10 Amps. For  $R=20$  ohms. Find the firing angle. (6) (Nov/Dec-2015, Nov/Dec-2011)
  7. Describe the operation of a single phase two pulse bridge converter using 4 SCR'S with relevant waveforms. (10) (Nov/Dec-2010)
  8. Discuss the working of above converter in the converter mode with RLE load. (6) (Nov/Dec-2010)
  9. A single phase semi converter is operated from 120 V 50 Hz ac supply. The load current with an average value  $I_{dc}$  is continuous and ripple free firing angle
  10.  $\alpha = \pi/6$ . Determine.
    - (1) Displacement factor
    - (2) Harmonic factor of input current
    - (3) Input power factor. (10) (Nov/Dec-2010)
  11. Explain the operation of single phase full bridge converter with RL load for continuous and discontinuous load currents. (10) (Nov/Dec-2011)
  12. Describe using a power circuit and relevant waveforms the working of a single phase full converter with RL load. (16) (www.university questions.in), Describe the working of a single phase full converter in the rectifier mode with RL load. Discuss how one pair of SCRs is commutated by an incoming pair of SCRs. Illustrate your answer with the waveforms of source voltage, load voltage and source current. Assume continuous conduction. Also derive the expressions for average and RMS output voltage. (Nov/Dec-2013)
  13. A 230 V, 50 Hz, supply is connected to load resistance of 12 ohms through half wave controlled rectifier. If the firing angle is  $60^\circ$ , determine

- i. average output voltage (4)
  - ii. rms output voltage (4)
  - iii. ratio of rectification (4) and
  - iv. Transformer utilization factor (4). (Nov/ Dec- 2012, Nov/ Dec- 2014)
14. Write neat sketch and output voltage waveforms explain the working of single phase bridge rectifier. (16) ([www.universityquestions.in](http://www.universityquestions.in))
  15. Compare 3 pulse and 6 pulse converters. (Nov/ Dec-2016)
  16. Explain the operating principle of a single phase controlled bridge converter. (May/ June- 2016)
  17. Discuss the operation of single phase fully controlled rectifier supplying RL load with neat Waveforms. Also derive the expression for the average output voltage? (April/May-2017)
  18. Discuss the operation of a three phase semiconverter with 'R' load and also draw the output voltage waveforms for  $30^\circ$  and  $90^\circ$ .(April/May-2018)
  19. Explain the working of a single phase full converter for 'RL' load discontinuous mode of operation with neat sketch and waveforms. (April/May-2018)
  20. Discuss the operation of single phase half wave rectifier with RLE load .Also derive its average output voltage equations. (16) ([www.universityquestions.in](http://www.universityquestions.in))
  21. Derive the expressions for average output voltage and RMS output voltage of single phase semi converter. (16) ([www.universityquestions.in](http://www.universityquestions.in))
  22. Explain the operation of three phase full converter and also derive the expression for its average output voltage. (16) ([www.universityquestions.in](http://www.universityquestions.in))
  23. Explain the working of a single phase full converter in the rectifier mode with the RL load. Discuss how one pair of SCRs is commutated by an incoming pair of SCRs. Illustrate your answer with the waveforms of source voltage, load voltage and source current. Assume continuous conduction. Also derive the expressions for average and rms output voltage. (16) ([www.Vidarthiplus.com](http://www.Vidarthiplus.com))
  24. Explain the operation of three phase half wave controlled converter with inductive load. Sketch the associated waveforms. (16) ([www.Vidarthiplus.com](http://www.Vidarthiplus.com))

## **DUAL CONVERTERS**

25. Describe the working of single phase and three phase Dual converter. (16) ([www.universityquestions.in](http://www.universityquestions.in), ([www.Vidarthiplus.com](http://www.Vidarthiplus.com)), Describe briefly the working of Dual converter with a neat circuit diagram.(8) (Nov/Dec-2013)
26. Explain the operating principle of single phase dual converter. ((Nov/Dec-2015)
27. Explain the two functional modes of dual converter with necessary diagrams. (16) (May/ June- 2014), Explain the operation of dual converter with complete circuit diagram and waveforms. (Nov/Dec- 2014), Explain the operation of single phase dual converter with circulating and non-circulating

conduction current type. (www.Vidyardhiplus.com), With neat sketch describe voltage and current waveforms of a circulating current type dual converter. (16) (Apr/May- 2015)

28. Write a short note on Dual converters. (Nov/ Dec-2016)
29. Explain the operating principle of three phase dual converter with necessary waveforms. (May/ June- 2016)
30. Explain the operation of dual converter with complete diagram and Waveform. (Apr/May- 2017)

### **EFFECT OF SOURCE INDUCTANCE**

31. Discuss the effect of source inductance on the performance of single phase full converter. (16) (May/ June- 2014), Explain the effect of source inductance in controlled rectifiers. (Apr/May- 2015)
32. Explain the effect of source inductance of a three pulse converter. (Nov/ Dec-2016)

### **PERFORMANCE PARAMETERS**

33. Define displacement factor, power factor, harmonic factor and current distortion factor. (8) (Apr/May- 2015)
34. Determine the performance parameters of a phase controlled converter. (Nov/ Dec-2016)

### **PART- C**

1. Explain the working of three phase full converter with R load for the firing angles of  $60^\circ$ ,  $90^\circ$  and  $150^\circ$ . (16) ((Nov/Dec-2010)
2. A single phase full converter is connected to 'R' load. The source voltage is of 230V, 50 Hz. The average load current is of 20A. For  $R=10\Omega$ , find the firing angle and also find the RMS output voltage. (8) (April/ May-2018)
3. A 2kW, 400 V resistive load is connected to a three phase semi converter. The input to the converter is 400 V, 50 Hz. Find the load average voltage and current when the load consumes 1000 watts.
4. i. Explain the working of the following circuit. Draw and find out the expression for output voltage. (8) (April/ May-2018)

ii. In this single phase full converter T1 and T4 are given pulses at every ' $\alpha$ '. T2 and T3 are given pulses at every ' $\alpha+180^\circ$ '. Unknowingly the gate pulses of T2 and T3 are removed and was given by

the pulses of T1 and T2. Now explain, draw and derive the output voltage equation.(7) (April/ May-2018)

5. Describe the working of single phase and three phase Dual converter. (16)

### **UNIT – III** **DC TO DC CONVERTERS**

#### **PART - A**

1. Give the Uses & resonant switching. (Nov/Dec- 2011)
2. Mention any two disadvantages of frequency modulation control strategy. (Nov/Dec- 2010)
3. What are the advantages of ZVS when compared to ZCS? (Nov/Dec- 2010)
4. Brief up the working of 4 quadrant DC chopper(Nov/Dec- 2012)
5. What is constant frequency control of DC chopper? (Nov/Dec- 2012)
6. What do you mean by time ratio control? (Nov/Dec- 2013)
7. What is a DC chopper? (Nov/Dec- 2013)
8. Compare half controlled rectifier and full controlled rectifier. (May/ June- 2014)
9. What is dual converter? Mention its functional mode of operation. (May/ June- 2014)
10. Write the applications of DC chopper. (Nov/Dec- 2014)
11. Distinguish between time ratio control and current limit control employed in
12. DC chopper. (Nov/Dec- 2014)
13. What are the disadvantages of frequency modulation scheme compared to PWM scheme? (April/ May-2015)
14. What is meant by inverting regulator? (April/ May-2015)
15. What is time ratio control in DC to DC converter. (April/ May-2015)
16. Define current limit control in DC to DC converter. (April/ May-2015)



17. What is meant by PWM control in DC Chopper? (May/ June- 2016)
18. What is Duty Cycle? (May/ June- 2016)
19. Give any two advantages of DC to DC converter. (Nov/ Dec-2016)
20. Name any two applications of SMPS. (Nov/ Dec-2016)
21. What are the different classifications of chopper depending upon the direction of current and voltage? (Nov/ Dec-2016)
22. What are the different control strategies in DC chopper? (Nov/ Dec-2016)
23. What is meant by PWM control in DC Chopper? (May/ June- 2016)
24. Define Duty Cycle. (May/ June- 2016)
25. Write the applications of DC Chopper. (April/May-2017)
26. What is meant by resonant converter? (April/May-2017)
27. What is meant by 'current limit control' of a chopper? (April/May-2018)
28. What is a resonant converter? (April/May-2018)
29. What is meant by dc chopper? ([www.universityquestions.in](http://www.universityquestions.in))
30. What are the advantages and applications of dc chopper? ([www.universityquestions.in](http://www.universityquestions.in))
31. What are the applications of DC Chopper: ([www.universityquestions.in](http://www.universityquestions.in))
32. What is meant by step-up and step-down chopper? ([www.universityquestions.in](http://www.universityquestions.in))
33. What is meant by duty-cycle? ([www.universityquestions.in](http://www.universityquestions.in))
34. What are the two types of control strategies? ([www.universityquestions.in](http://www.universityquestions.in))
35. What is meant by TRC? And what are the two types of TRC? ([www.universityquestions.in](http://www.universityquestions.in))
36. What is meant by PWM control in dc chopper? ([www.universityquestions.in](http://www.universityquestions.in))
37. What are the advantages of PWM control? ([www.universityquestions.in](http://www.universityquestions.in))
38. What is meant by load commutation? ([www.universityquestions.in](http://www.universityquestions.in))
39. What is constant frequency control of chopper? ([www.universityquestions.in](http://www.universityquestions.in))
40. What are the different techniques of PWM techniques? ([www.universityquestions.in](http://www.universityquestions.in))
41. Mention the disadvantages of PWM. ([www.universityquestions.in](http://www.universityquestions.in))
42. What are the types of chopper? ([www.universityquestions.in](http://www.universityquestions.in))
43. Draw the circuit diagram of four quadrant chopper ([www.universityquestions.in](http://www.universityquestions.in))
44. Mention the mode of operation in dual converter. ([www.universityquestions.in](http://www.universityquestions.in))
45. What is meant by resonant converters? ([www.universityquestions.in](http://www.universityquestions.in))
46. Write down the expression for the average output voltage for step down and step up chopper. ([www.vidyathiplus.in](http://www.vidyathiplus.in))
47. What are the advantages of current commutated chopper? ([www.vidyathiplus.in](http://www.vidyathiplus.in))
48. What are the advantages of load commutated chopper? ([www.vidyathiplus.in](http://www.vidyathiplus.in))
49. What are the disadvantages of load commutated chopper? ([www.vidyathiplus.in](http://www.vidyathiplus.in))

## **PART – B**

### **STEP-DOWN AND STEP-UP CHOPPER- control strategy**

1. Discuss the principle of operation of DC-DC step down chopper with suitable waveform. Derive an expression for its average DC output voltage. (8) (Nov/Dec- 2010). Draw the power circuit for step down DC chopper and explain its operation for inductive load. What is the role of freewheeling diode in such choppers? (16) Explain the principle of operation of DC-DC step down chopper with suitable waveform. Derive an expression for its average DC output voltage. (8) (Nov/Dec- 2015)
2. Describe the principle of step up chopper. Also derive the expression for average output voltage in terms of input voltage and duty cycle. (April/ May- 2015)
3. Explain the principle of working of step up chopper with neat circuit diagram and waveforms. Derive the expression for its average output voltage. (Nov/Dec- 2013), Describe the principle of step-up chopper. Derive an expression for the average output voltage in terms of input dc voltage & duty cycle. (16)
4. With neat diagrams, explain the construction and working of step down and step up chopper. Give its applications. (Nov/ Dec-2016)
5. Explain the working principle of voltage commutated chopper showing the current and voltage waveform across each device. (Nov/ Dec-2016)
6. (i) Explain the control strategies of chopper. (8)
7. (ii) A step down DC chopper has input voltage of a 230 V with 10 ohms load resistor connected, voltage drop across chopper is 2 V what it is ON. For a duty cycle of 0.5, Calculate
  - (1) Average and RMS value of output voltage
  - (2) Power delivered to load. (8) (April/ May- 2017)
8. Describe the working of four quadrant chopper. (16) (www. Universityquestion.in)
9. Describe in detail about the types of chopper. Derive an expression for the average output voltage in terms of input dc voltage & duty cycle (16) (www. Universityquestion.in)

### **CURRENT COMMUTATED CHOPPER**

10. Explain the working of current commutated chopper with aid of circuit diagram and necessary waveforms. Derive an expression for its output voltage. (16) (www. Universityquestion.in)

### **VOLTAGE COMMUTATED CHOPPER**

1. Discuss in detail, the-voltage commutated chopper. (May/ June-2016)
2. Describe the voltage commutated chopper with neat sketch. (April/May-2018)
3. Explain the working of voltage commutated chopper with aid of circuit diagram and necessary waveforms. Derive an expression for its output voltage. (16) (www. Universityquestion.in)

## **SWITCHED MODE REGULATORS BUCK, BOOST, BUCK BOOST CONVERTER**

4. Explain the working of Buck-Boost converter with sketch and waveforms and also derive the average output voltage (16) (Nov/Dec- 2011), Explain the operation of buck boost converter with neat circuit diagrams and waveforms (16) (www. Universityquestion.in), Explain the working of Buck-Boost converter with sketch and waveforms and also derive the expression for 1 second. (16) (May/ June- 2016)
5. Draw the circuit diagram of buck regulator and explain its working principle with necessary waveforms. Derive the expression for peak to peak supply voltage of the capacitor that is present across the load. (May/ June- 2016)
6. Discuss the operation of DC-DC boost converter and prove that its output voltage is always greater than input voltage. (Nov/Dec- 2012), Describe the working principle of boost converter with necessary circuit and waveform. (May/ June- 2016)
7. Explain the operation of buck boost converter with appropriate power circuit and waveforms. (April/ May- 2015)
8. Describe with neat diagrams the principle and working of Buck- Boost converter. (Nov/ Dec- 2016)
9. Derive the expression for voltage gain in a dc - de boost converter and explain the modes of operation with relevant waveforms. (Nov/ Dec-2016)
10. Explain the working of Buck-Boost converter with a neat schematic diagram and waveforms and also derive the source voltage and current expression for the same. (May/ June-2016)
11. Explain the working. of Boost converter in detail with necessary waveforms and equation. (April/May-2017)
12. With a neat sketch and output voltage waveforms explain the working of a boost converter. (April/May-2018)

### **RESONANT CONVERTER**

13. What is called resonant switching? Explain its concept with relevant circuit diagrams. (Nov/ Dec-2016)

### **PART- C**

1. A step down dc chopper has resistive load of  $R=10\ \Omega$  and input voltage  $V_s=200\text{v}$ . When the chopper remains ON its voltage drop is 2 for a duty cycle of 0.6 Calculate:
  - (1) Average and R.M.S value of output voltage
  - (2) Power delivered to load. (16) (Nov/Dec- 2015)

**UNIT-4**  
**INVERTERS**  
**PART-A**

1. What is meant by inverter? (Nov/Dec- 2011)
2. What is meant a series inverter? Why it is called so? (Nov/Dec- 2011)
3. Differentiate VSI from CSI. (Nov/Dec- 2010), Compare VSI and CSI (May/ June- 2014) Compare CSI and VSI. (Nov/Dec- 2015)
4. List various applications of phase controlled converters. (Nov/Dec- 2010)
5. What is a current source inverter? (Nov/Dec- 2012)
6. What are the advantages of PWM inverter? (Nov/Dec- 2012)
7. What is the advantage of 120° mode of inverter operation over 180° mode? (Nov/Dec- 2013)
8. List the advantage of using PWM control to inverters (Nov/Dec- 2013), What are the advantages of PWM control in inverters? (May/ June- 2014)
9. What is meant by voltage source Inverter? (Nov/Dec- 2014)
10. Differentiate VSI and CSI (April/ May-2015)
11. Define modulation index in PWM(April/ May-2015)
12. What is harmonic elimination by PWM? (April/ May-2015)
13. Draw the circuit diagram and waveform of single phase current source inverter. (April/ May- 2015)
14. What are the types of PWM techniques? (Nov/Dec- 2016)
15. Sketch a diagram of current source inverter. (Nov/Dec- 2016)
16. Define modulation index and what its use is? (Nov/Dec- 2016)
17. What are the applications of CSI? (Nov/Dec- 2016)
18. Compare CSI and VSI. (May/ June- 2016)
19. What are the applications of Inverter? (May/ June- 2016)
20. Why thyristors are not preferred for Inverter? (April/ May-2017)
21. What are, the disadvantages of the harmonics present in the inverter system? (April/ May-2017)
22. What is meant by 'space vector modulation'? (April/ May-2018)
23. Differentiate CSI over VSI. (April/ May-2018)
24. Why diodes should be connected in antiparallel with the thyristors in inverter circuits?
25. What is the condition to be satisfied in the selection of L and C in a series inverter?

26. What are the applications of a series inverter?
27. What is meant by McMurray inverter?
28. What is meant by PWM control?
29. What are the applications of an inverter?
30. Why thyristors are not preferred for inverters?
31. What are the advantages of 120 degree mode of operation over 180 degree mode of operation?
32. What are the applications of a CSI?
33. What are the applications of ac voltage controllers?
34. Mention the difference between Sinusoidal PWM over modified PWM techniques.
35. Define Space Vector Modulation.
36. What is meant by voltage source Inverter?

## **PART-B**

### **SINGLE PHASE VOLTAGE SOURCE INVERTERS**

1. Describe the working of a 1phase full bridge inverter with relevant circuit and waveforms. (8) (Nov/Dec- 2010)
2. Describe the working of a single phase full bridge inverter supplying R, RL loads with relevant circuit diagram and waveforms (May/ June- 2016), describe the working of a 1 phase full bridge inverter with relevant circuit and waveforms. (8) (Nov/Dec- 2010)
3. (i) Comparison between Voltage source inverter and current source inverter. (8) (Nov/Dec- 2016)

### **THREE PHASE VOLTAGE SOURCE INVERTERS (120 MODE AND 180 MODE OPERATION)**

4. With a neat sketch and output voltage waveforms explain the working of three phase bridge inverter in 180 degree mode of operation. (16) (Nov/Dec- 2011)
5. Discuss in detail about the functioning of three phase voltage source inverter in 120° operating mode. (Nov/Dec- 2012), Discuss the functioning of three phase voltage source inverter in 120° operating mode.
6. Discuss the principle of working of three phase bridge inverter with an appropriate circuit diagram. Draw the output phase and line voltage waveforms on the assumption that each thyristor conducts for 180° and resistive load is star connected. The sequence of firing of various SCR should also be indicated. (16) (Nov/Dec- 2013) Explain the operation of 3 phase voltage source inverter in 180° mode of conduction. (16) (Nov/Dec- 2014) Explain the principle of operation of 3 phase voltage

source inverter with  $180^\circ$  conduction mode with necessary waveforms and circuits. Also obtain the expression for line to line voltage. (May/ June- 2016)

7. Briefly explain the different types of PWM schemes available for voltage control in an inverter. (16) (Nov/Dec- 2014) With the neat circuit and output waveforms, explain the operation of three phase bridge inverter in  $120^\circ$  mode of operation. (16) (Nov/Dec- 2015)
8. With the neat sketch and output waveforms, discuss three phase inverter operating in  $180^\circ$  mode. (Nov/Dec-2016)
9. With the neat sketch and output waveforms, explain the operation of three phase bridge inverter in  $120^\circ$  mode of operation. (May/June-2016)
10. Discuss the working of a 3 phase inverter in  $120^\circ$  conduction mode. (April/ May-2018)
11. Explain the operation of 3 phase bridge inverter for  $120^\circ$  mode of operation with aid of Relevant phase and line voltage waveforms. (April/ May-2017)

### **VOLTAGE & HARMONIC CONTROL**

12. Explain the Harmonic reduction by transformer corner lines and stepped wave inverters. (16) (Nov/Dec- 2010)
13. Draw the circuit diagram of current source inverter and explain its operation with relevant waveforms (May/ June- 2016)
14. What is the need for controlling the output of the inverter? Classify the various techniques adopted to vary the inverter gain and brief on sinusoidal PWM. (May/ June- 2016)
15. Write in detail about voltage and harmonic control with neat diagrams. (Nov/Dec- 2016)
16. (ii) Explain anyone method to reduce the harmonic content in the inverter. (Nov/Dec- 2016)
17. State different methods of voltage control inverters. Describe about PWM control in inverter. (April/ May- 2017)

### **PWM TECHNIQUES**

18. What is PWM? List the various PWM techniques and explain any one of them. (8) (Nov/Dec- 2010), Explain in detail, the various types of PWM methods employed in an inverter. (Nov/Dec- 2012) Briefly explain the different types of PWM schemes available for voltage control in an inverter. (16) (Nov/Dec- 2014) Explain different PWM techniques in detail. (8) (May/ June- 2014) Briefly explain the different types of PWM schemes available for voltage control in an inverter. (16) (Nov/Dec- 2014)
19. State different methods of voltage control inverters. Describe about PWM control in inverter. (16), Explain different methods of voltage control adopted in inverter with suitable wave forms (16),

- Explain different methods of voltage control adopted in inverter with suitable waveforms. (16)  
(Nov/Dec- 2015)
20. Name the different PWM techniques. With neat diagrams, explain its working and applications.  
(Nov/Dec- 2016)
21. Write short notes on the following (8+8=16) (Nov/Dec- 2013)
1. Sinusoidal pulse width modulation as applied to inverters
  2. Current source inverters
22. Explain the following PWM techniques used in inverter. (May/ June- 2016)
- i. Sinusoidal PWM
  - ii. Multiple PWM
23. State different methods of voltage control inverters. Describe about PWM control in inverter. (April/  
May- 2017) (repeated)
24. Explain the SPWM and modified SPWM techniques for inverter switching. (April/ May-2018)

## **CURRENT SOURCE INVERTER**

25. Draw the circuit diagram of current source inverter and explain its operation with relevant waveforms  
(May/ June- 2016)
26. Explain the single phase current source inverter. State the merits and demerits of them. (May/ June-  
2016)
27. Describe the working of a single phase series inverter with appropriate circuits and waveforms. For  
this inverter, derive an expression for output frequency in terms of circuit parameters and  $T_{OV}$ .  
(April/ May- 2015)
28. Write short notes on the following (8+8=16) (Nov/Dec- 2013)
3. Sinusoidal pulse width modulation as applied to inverters
  4. Current source inverters

## **PART- C**

1. Explain the principle of operation of 3 phase voltage source inverter with  $180^\circ$  conduction mode with  
necessary waveforms and circuits. Also obtain the expression for line to line voltage. (15)
2. A single phase full bridge inverter feeds power at 50 Hz to RLC load with  $R= 5$  ohms,  $L=0.3$  H and  
 $C= 50\mu$ . The DC input voltage is 220V DC. Find
  - i. an expression for load current up to 5<sup>th</sup> harmonics
  - ii. Power absorbed by the load and the fundamental power
  - iii. the RMS and peak currents of each thyristor

iv. conduction times of thyristors and diodes, if only fundamental components were considered.  
(April/ May- 2015)

## **UNIT-V**

### **AC TO AC CONVERTERS**

#### **PART-A**

1. What are the applications of cyclo converter? (Nov/Dec- 2011)
2. What is Integral cycle control? (Nov/Dec- 2011)
3. What is meant by cyclo converter? (Nov/Dec- 2010)
4. Write the output R.M.S. voltage for single phase AC voltage controller with resistance load. (Nov/Dec- 2010)
5. Write the principle of operation of cyclo converter. (Nov/Dec- 2012)
6. Give any two important applications of AC voltage controllers. (Nov/Dec- 2012)
7. What is a matrix converter? (Nov/Dec- 2013)
8. Enumerate some of the industrial applications of cyclo-converter. (Nov/Dec- 2013)
9. What is the control range of firing angle in AC voltage controller with RL load? (May/ June- 2014)
10. What is matrix converter? (May/ June- 2014)
11. What is a cyclo-converter? Write any two industrial applications of cycloconverter. (April/ May- 2015)
12. What is burst firing? (April/ May-2015)
13. Draw matrix converter circuit. (April/ May-2015)
14. What is the principle of ON- OFF control of AC controller? (April/ May-2015)
15. What is the advantage of AC to AC converters? (Nov/Dec- 2016)
16. What are called Matrix converters? (Nov/Dec- 2016)
17. Differentiate ON - OFF control and phase control in AC - AC converters. (Nov/Dec- 2016)
18. What is cyclo converter? (Nov/Dec- 2016)
19. What is integral cycle control? (May/ June- 2016).
20. What are the different control techniques for AC regulator? (May/ June- 2016)
21. What is a matrix convener? (April/ May- 2017)
22. Compare integral cycle control and phase control in AC voltage controllers. (April/ May- 2017)
23. List out the applications of AC voltage controller. (April/May-2018)
24. Mention the advantages of matrix converter over conventional converter. (April/May-2018)
25. What is cycloconverter?
26. What is integral cycle control in AC voltage controller?
27. Write the output RMS voltage for single phase AC voltage controller with resistive load.
28. What is the difference between ON-OFF control and phase control?
29. What is the advantage of ON-OFF control?
30. What is the duty cycle in ON-OFF control method?
31. What are the disadvantages of unidirectional or half-wave ac voltage controller?
32. What type of gating signal is used in single phase ac voltage controller with RL load?
33. What is meant by cyclo-converter?
34. What are the applications of cyclo-converter?
35. What does ac voltage controller mean?



36. What are the applications of ac voltage controllers?
37. Write down the expression for single phase and three phase RMS output voltage of single phase and three phase cyclo converter?
38. Compare single phase cyclo converter over three phase cyclo converter.
39. Define Multistage sequence Control.
40. What is integral cycle control?

## **PART-B**

### **SINGLE PHASE AND THREE PHASE AC VOLTAGE CONTROLLERS**

1. Describe the operation of single phase full wave AC voltage controller with the help of voltage and current waveform. Also derive the expression for average value of output voltage. (10) (Nov/Dec- 2010) Explain the operation of single phase full wave AC voltage regulator with help of voltage and current waveform. (10) (Nov/Dec- 2015)
2. Discuss the working of a single phase AC voltage controller with RL loads when its firing angle is more than the load power factor angle. Illustrate with waveforms. (May/ June- 2016)
3. Explain in detail the operation of single phase full wave AC voltage regulator with the help of voltage and current waveform for various loads. (May/ June- 2016)

### **POWER FACTOR CONTROL**

4. With the aid of circuit diagram and waveform explain the operation of
  - i. power factor control in AC voltage regulation (8)
  - ii. Single phase full wave AC voltage controller. (8) (May/ June- 2014)
5. What is the importance of power factor control in a converter? Explain in detail. (Nov/Dec- 2016)

### **MULTISTAGE SEQUENCE CONTROL**

6. Discuss the working of 2 stage sequence control of AC voltage controller. (16) (Nov/Dec- 2011)
7. Write short note on the following: (16) (Nov/Dec- 2013)
  1. Integral cycle control
  2. Multistage sequence control
  3. Step up cyclo converter
  4. Matrix converter
8. Explain the working of bidirectional single phase voltage controller with purely inductive load. (April/ May-2015)
9. Explain the working of two stage sequence control of AC Voltage controller. (Nov/Dec- 2016)
10. i. What is meant by multistage sequence control? Explain it with relevant circuit diagrams.  
ii. Compare single phase and three phase cycloconverters. (Nov/Dec- 2016)
11. Explain the operation of two stage sequence control of AC Voltage Controller. (April/ May -2017)

12. Explain the operation of a multistage sequential control in single phase AC voltage controller. (April/May-2018)

### **SINGLE PHASE AND THREE PHASE CYCLO CONVERTERS**

13. Describe three-phase to three phase cycloconverter with relevant circuit arrangement using 18 thyristors. (8) (Nov/Dec- 2010)
14. Discuss the basic principle of 1phase to 1 phase step down cycloconverter for a bridge type converter. Assume both discontinuous and continuous conduction and draw the load current and load voltage waveforms for both the cases. Mark the conduction of various thyristors. (16) (Nov/Dec- 2013)
15. Explain the circuit diagram of three phase to single phase cyclo converter and explain its operation with necessary waveforms. (16) (May/ June- 2014). Draw the circuit diagram of 3 phase to 1 phase cyclo converter and explain its operation with waveform. (May/ June- 2016) Explain the working of three phase to single phase cycloconverter with neat circuit diagram and necessary waveforms. (16) (Nov/Dec- 2015) Discuss the operation of three phase-single phase cycloconverter with neat circuit diagram and waveforms. (Nov/Dec- 2012) Discuss the working of a 3 phase to single phase cyclo-converter with neat voltage and current waveforms. (16) (Nov/Dec- 2011) Write short notes on the following: Three phase to single phase cyclo converter (10) (Nov/Dec- 2014)
16. Explain the working of step up and step down cycloconverter. (April/ May-2015)
17. With the aid of the circuit diagram, explain the operation of 3phase to 3 phase cyclo converter employing 3 phase half wave circuit and list few of its applications. (May/ June- 2016)
18. Explain the working of three phase to single phase cycloconverter with neat circuit diagrams and necessary waveforms. (May/ June- 2016)
19. Discuss the operation of three phase to single phase cycle-convener with neat circui~diagram8 and Waveforms. ( April/ May-2017)
20. Explain the operation of a three phase to three phase cyclo converter.( April/ May-2018)
21. Explain the working of three phase to single phase circuit diagram and necessary waveforms. (May/ June- 2016)

### **MATRIX CONVERTER**

22. Write short notes on the following: Matrix converter (Nov/Dec- 2014), Write a short notes on matrix converter. (6) (Nov/Dec- 2015)
23. Write a short note on Matrix converters. (Nov/Dec- 2016)