**Subject Name: Power Electronics (PE)**

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**Year and Sem, Department: III-EEE SEM-II**

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| **Power Electronics**  **Unit Wise Questions** | |
| **Unit – I** | |
| **2 Mark Questions** | |
| 1. | Define commutation and mention the Commutation methods. |
| 2. | what is snubber circuit mention. Its significance. |
| 3. | Write the differences between MOSFET AND BJT? |
|  | **3 Marks Questions** |
| 4. | Explain the static V-I Characteristics of Thyristors with elaborating the following :  (a) Latching current (b) Holding current (c) on-state and off-state condition |
| 5. | Explain the operating regions of transfer characteristics of BJT? |
| 6. | Explain the following thermal ratings of SCRs  i) Junction temperature ii) Transient thermal resistance |
|  | **5 Marks Questions** |
| 7. | Explain the dynamic turn on and turn off characteristics of SCR? |
| 8. | Explain the two-transistor analogy with neat circuit diagram and derive the expression for the anode current. |
| 9. | Explain the principle operation of MOSFET with neat diagrams? |
| 10. | The SCRs are used in a string to withstand a d.c. voltage of 12KV. The maximum leakage current and recovery charge difference of SCRs is 10 mA and 50 µC respectively. The values of R for steady state equalizing circuit is 40 K. and value of C of dynamic equalizing circuit is o.2 µf. Find the steady state and transient voltage derating factor**.** |
| **Unit – II** | |
| **2 Mark Questions** | |
| 1. | Explain the phase controlled technique in controlled rectifier. |
| 2. | What are the advantages of 1-phase bridge converter over 1-phase midpoint converter |
| 3. | What are the disadvantages in circulating current dual converter |
|  | **3 Marks Question** |
| 1. | Draw the power circuit diagrams for single and three phase dual converters? |
| 2. | Explain the main features of freewheeling diode and its advantages |
| 3. | A single phase half controlled bridge converter is operated from a 230 V, 50 Hz supply and load is resistance of R=10.. If the average output voltage is 25% of the maximum possible average output voltage. Calculate: (i) Delay angle (ii) rms and average output currents and  (iii) Average and rms thyristor currents |
|  | **5 Marks Question** |
| 1. | Explain the operation of three phase fully controlled bridge converter with RL loads. Describe in detail with discontinuous conduction mode with associated waveforms. |
| 2. | (a).Explain the operation of single phase half controlled bridge converter for RL load and freewheeling diode, with the help of neat circuit diagram and waveforms.  (b). Explain the main features of freewheeling diode and its advantages. |
| 3. | (a).derive the output voltage expression of a 1- phase full converter including effect of source inductance.  (b). A three phase full converter is supplied from a three phase400v, 50hz and operates with a firing angle of45deg. The load current is maintained constant at 10A and load voltage is 360V.calculate source inductance and overlap angle. |
| 4. | A single phase fully controlled bridge converter is operated from a 230 V, 50 Hz supply and load is resistance of R=10.. If the average output voltage is 25% of the maximum possible average output voltage. Calculate: (i) Delay angle (ii) rms and average output currents and  (iii) Average and rms thyristor currents |
|  |  |
| **Unit – III** | |
| **2 Mark Questions** | |
| 1. | What is a dc chopper .explain its basic principle of operation. |
| 2. | Explain the various control strategies for varying duty cycle. |
| 3. | Write the applications of dc chopper? |
|  | **3 Marks Question** |
| 1. | **Explin the principle operation of step-up chopper with R –load and derive the relavent output expressions?** |
| 2. | Derive the expression for minimum and maximum values of load current for a type - A chopper and also derive the current ripple . |
| 3. | An R-L-E type load is operating in chopper circuit from 400Vd.c source. For the load L=0.05Hand R=0.5ohms. For a duty cycle of 0.3 find the chopping frequency to limit the amplitude of current excursion to 8A. |
|  | **5 Marks Question** |
| 1. | Discuss the working of a Morgan’s chopper circuit and its commutation procedure with the help of neat circuit diagram |
| 2. | Explain the operation of second quadrant or type-B chopper with relavent wave foms |
| 3. | Explain the operation of dc chopper with R-L-E load with relavant waveforms. |
| 4. | A current commutated chopper controls battery powered electric car. The battery voltage is 100v,starting current is 100A,scr turn off time is 20us,chooping frequency is 400hz. Compute the commutating capacitor and commutating inductor. assume icm/iom =3 |
| **Unit - IV** | |
| **2 Mark Questions** | |
| 1. | Define the ac voltage controllers and give its application. |
| 2. | what is the principle operation of ac voltage controller. |
| 3. | Give the classification of cyclo converter and explain. |
|  | **3 Marks Question** |
| 1. | Explain the principle of ON-OFF control used in a.c. voltage controller.AND Derive the expression for the input power factor |
| 2. | Explain the operation of step up cycloconverter with waveforms. |
| 3. | Mention applications of cyclo converter |
|  | **5 Marks Question** |
| 1. | For a single phase AC voltage controller feeding resistance load20ohms. The rms of i/p voltage is 220Vat 50HZ . the thyristors are ON for 30 cycles and OFF for 70 cycles. Calculate the value of a). the rms o/p voltage b). input power factor c). the avg and rms value of thyristor currents |
| 2. | For a single phase mid-point cyclo-converter, explain the operation of the circuit when fed to R-load with the help of neat circuit diagram and relevant output waveforms for α = 30deg and α = 120deg for f0 = 1/4 fs. |
| 3. | explain the modes of operation of TRIAC.? |
| 4. | For a single phase AC voltage controller feeding resistance load20ohms. The rms of i/p voltage is 220Vat 50HZ . the thyristors are ON for 30 cycles and OFF for 70 cycles. Calculate the value of a). the rms o/p voltage b). input power factor c). the avg and rms value of thyristor currents |
| **Unit - V** | |
| **2 Mark Questions** | |
| 1. | Define inverter. give its applications. |
| 2. | what are the methods of voltage control within the inverter. |
| 3. | compare single pulse with modulation over multiple pulse width modulation |
|  | **3 Marks Question** |
| 1. | What are the different pulse width modulation techniques used for inverters. |
| 2. | Which of the schemes gives better quality of voltage and current |
| 3. | Calculate the output frequency of a series inverter circuit with following parameters, L=10mH, c= 0.1Uf, R=400 ohms, t off= 0.2msec. Determine the attenuation factor. |
|  | **5 Marks Question** |
| 1. | Explain the working of a single phase series inverter with circuit diagram and output waveforms for an resistive load. |
| 2. | Discuss the operation of Mc Murray inverter with the help of circuit diagram and Necessary waveforms. |
| 3. | Discuss various voltage control techniques for single phase bridge inverter with the help of signal waveforms for each of the technique. |
| 5. | Discuss the working of a single phase parallel inverter and its commutation process  with neat circuit diagram and necessary waveforms. |

**OBJECTIVE QUESTIONS**

**UNIT-1**

**POWER SEMICONDUCTORS DEVICES**

1. An SCR can be operated in [ ]

a) Only on reverse bias condition b) Only on forward biased condition

c) Both forward bias and reverse bias d) Without forward bias

2. A thyristor can be termed as [ ]

a) Dc switch b) AC switch c) Both AC and DC switch d) Square wave switch

3. When anode positive with respective to cathode in an SCR the number of blocked pn

junctions

a) 1 b) 2 c) 3 d) 4 [ ]

4.In a thyristor anode current is made of [ ]

a) Electronics only b) Electronics or holes

c) Electronics and holes d) Electronics, holes, protons

5.The number of p-n junction in a thyristor are/is [ ]

a) 1 b) 2 c) 3 d) 4

6.An SCR is a [ ]

a) Two layer two junction device b)Three layer two junction

c) Four layer three junction device d) Four layer four junction device

7.When cathode is positive with respective to anode in an number of blocked pn junctions

a) 1 b) 2 c) 3 d) 4

8.An SCR has [ ]

a)One terminal b)Two terminal c)Three terminal d)Four terminal

9.Choose the correct statement [ ]

a)Both MOSFET and BJT are voltage controlled devices

b)Both MOSFET and BJT are current controlled devices

c)MOSFET is a voltage controlled devices where as BJT is a current controlled device

d)MOSFET is current controlled devices and BJT are voltage controlled devices

10. As compared to power MOSFET, a BJT has [ ]

a) Lower switching losser but higher conduction loss

b) Higher switching losser but higher conduction loss

c) Higher switching losser but lower conduction loss

d) lower switching losser but lower conduction loss

11.Power MOSFET has three terminals called [ ]

a) Collector, emitter, and base b) Drain, source and base

c) Drain , source and gate d) Collector, emitter and gate

12.An IGBT has three terminals called [ ]

a) Collector, emitter, and base b) Drain, source and base

c) Drain , source and gate d) Collector, emitter and gate

13. A thyristor, when triggered, will change from forward blocking state to conduction state if

its anode to cathode voltage is equal to [ ]

a) Peak repetitive off state forward voltage b) Peak working off state forward voltage

c) Peak working off state reverse voltage d) Peak non repetitive off state forward voltage

14. When a thyristor gets turned on, gate drive [ ]

a) Should be removed

b) Should be removed in order to avoid increased losses and higher junction temperature

c) May or may not be removed

d) Should not be removed as it will turn off the SCR

15. Once SCR start conducting a forward current, its gate losses control over [ ]

a) Anode circuit voltage only b) Anode circuit current only

c) Anode circuit voltage and current d) Anode circuit current

16.An SCR can be brought to forward conducting state with gate circuit open when the applied

voltage exceeds [ ]

a) 1.5v b) Reverse breakdown voltage

c) Forward breakdown voltage d) Peak non repetitive off state voltage

17. In a thyristor, holding current is [ ]

a) More than latching IL Less than latching IL

c) Equal to IL Very small

18. During forward blocking state, a thyristor is associated with [ ]

a) Large current, low voltage b) Low current, large voltage

c) Medium current, large voltage d) High current, high voltage

19. Ratio of latching current to holding current of thyristor is generally of the order of

a) Two to three times b) Four to five times [ ]

c) Seven to eight times d) Ten to twelve times

20. Turn on time of an SCR can be reduced by using a [ ]

a) Rectangular pulse of high amplitude and narrow width

b) Rectangular pulse of low amplitude and wide width

c) Triangular pulse

d) Sinusoidal pulse

KEY: 1-B, 2-A, 3-A, 4-C, 5-C, 6-C, 7-B, 8-C, 9-C, 10-C, 11-C, 12-D, 13-B, 14-B, 15-C, 16-C, 17-B, 18-A, 19-A, 20- A

1. The function of connecting a zener diode in an UJT circuit, used for the triggering of SCR’s   
 is to

a) Expedite the generation of triggering pulses [ ]

b) Delay the generation of triggering pulses

c) Provide a constant voltage to UJT to prevent erratic firing.

d) Provide a variable voltage to UJT on the source voltage change.

2. The maximum firing angle that can be obtained from R-triggering [ ]

a) 00 b) 450 c) 300 d) 900

3. Using R-C triggering maximum firing angle that can be obtained practically [ ]

a) 1700 b) 900 c) 450 d) 00

4. R-C- triggering is preferred over R triggering method because it provides [ ]

a) Larger value of firing angles b) Quick firing

c) Accurate firing d) Large pulses

5. A pulse is used to trigger a thyristor because [ ]

a) Reduce harmonics b) Increases thyristor loss

c) Reduces thyristor loss d) Reduces harmonics and increases thyristor loss

6. For an UJT employed for triggering of an SCR, standoff ratio and dc source of η-0.64

voltage V is 30V. The UJT would trigger when emitter voltage is [ ]

a) 10 b) 12.8 c) 19.2 d)5V

7. Pulse gate triggering is achieved by [ ]

a) Rheostatic method b) R-C method

c) UJT relaxation oscillator d) R, r-C triggering methods

8. Intrinsic standoff ratio of a UJT is given [ ]

a) RB1+RB2 b) RB1/ RB2 c) RB1/ RB1+RB2 d) RB1-RB2

9. In an UJT, with V the voltage across two base terminals, the emitter potential at peak point

is given by

a) nVBB VD VD +VBB VD+nVBB

10. An UJT exhibits negative resistance region [ ]

a) Before the peak point b) Between peak and valley point

c) After the valley point d) Before the valley point

11. SCRs with a rating of 1000V and 200V are available to be used in a string to handle 6KV

and 1KV No. of serried connected SCRS, incase derating factor is 0.1 [ ]

a) 4 b)5 c) 6 d) 7

12. The di/dt rating of an SCR is specified for its [ ]

a) Decaying anode current b) Decaying gate current

c) Rising gate current d) Rising anode current

13. The function of snubber circuit connected across gate circuit is to [ ]

a) Suppress dv/dt b) Increase dv/dt

c) Decrease dv/dt d) Keep transient over voltages at a constant value

14. The object of connecting resistance and capacitance across gate circuit is to protect the

SCR gate against [ ]

a) over voltages b) Dv/dt c) Noise signals d) Over currents

15. For dynamic equalizing circuit used for serried connected SCR’s the choice of C is based on

a) Reverse recovery characteristics b) Turn - on characteristics [ ]

c) Turn -off characteristics d) Rise-time characteristics

16. For an SCR dv/dt protection is achieved through the use of [ ]

a) R in series with SCR b) RC across SCR

c) L in series with SCR d) L across SCR

17. For an SCR, di/dt protection is achieved through the use of [ ]

a) R in serried with SCR b) RL in serried with SCR

c) L in serried with SCR d) L across SCR

18. Heat sinks are made from [ ]

a) Copper b) Steel c) Aluminium d) Copper and steel

19. Practical way of obtaining static voltage equalization in series connected SCRs is by[ ]

a) One register across the string b) Resistors of different values

c) Resistors of the same value across each SCR d) One resistor in series with the string.

20. If the string efficiency is 0.1 then the derating factor is [ ]

a) 0.1 b) 0.2 c) 0.8 d) 0.9

KEY: 1-C, 2-D, 3-A, 4-A, 5-C, 6-C, 7-C, 8-C, 9-D, 10-B, 11-D, 12-D, 13-A, 14-C, 15-A, 16-B, 17-C, 18-C, 19-C, 20-D

**UNIT-II**

**PHASE CONTROLLED RECTIFIERS (1-PHASE& 3-PHASECONVERTERS)**

1. A. Single phase half-wave rectifier has 400Sin 314t as the input voltage and R as the load.

For a firing angle of 600 for the SCR, average output voltage is [ ]

a) 400/p b) 200/p c) 300/p d) 250/p

2. In the following converter whose pure number is one [ ]

a) 1-Ø Full wave converter b) 1- Ø Half controlled converter

c) 1- Ø Half wave converter d) 3- Ø Half wave converter

3. In a 1- Ø half wave converter with R load, it the conduction interval is 1500 then what is the

firing angle of the SCR [ ]

a) 300 b) 1800 c) 600 d) 1500

4. In a 1- Ø half wave converter with R load, if the firing angle of the SCR is 300 the angle at

which SCR stops ;the conduction is [ ]

a) 300 b) 1800 c) 600 d) 1500

5. The pulse number of single phase half wave converter is [ ]

a) 2 b) 4 c) 3 d) 1

6. In 1- Ø half wave converter with R load, if the firing angle of SCR is 300 what is the

conduction interval of thyristor is [ ]

a) 300 b) 600 c) 1500 d) 1800

7. A 1- Ø half wave converter gives ------ mode of operation with resistive load [ ]

a) Continuous b) Discontinuous

c) Continuous and discontinuous d) For certain firing angles only continuous

8. In the following converter which one has internal free wheeling action [ ]

a) 1- Ø half wave with R load b) 1- Ø full wave with bridge

configuration

c) 1- Ø full wave with midpoint configuration d) 1- Ø half controlled converter

9. Effect of free wheeling diode [ ]

a) Input power factor decreases b) Reactive power consumption

increases

c) Current waveform becomes discontinuous d) Input power factor increases

10. Using a free wheeling diode current wave form becomes [ ]

a) More continuous b) More discontinuous

c) Sometimes continuous and discontinuous d) No effect

11. In a 1- Ø half wave converter with R-L load and extinction angle is 2100 and firing angle is

300. What is the conduction angle of SCR [ ]

a) 2100 b) 300 c) 180 d) Zero

12. What is the pure number of 1- Ø half wave converter with free wheeling diode [ ]

a) 2 b) 1 c) 3 d) Zero

13. In a single phase half controlled converter with R-load and firing angle is 600. Each diode

conducts for

a) 1200 b) 1500 c) 1800 d) zero [ ]

14. In a single phase half controlled converter with R-load and firing angle is 600. conducts

interval of freewheeling diode is [ ]

a) α b) α-β c) π- α d) zero

15. In a single phase half controlled converter with R-load for a firing angle of 300. The

conduction angle of scr is [ ]

a) 300 b)1500 c) 1800 d) Zero

16. In a single phase half controlled converter with R load the output current wave form is

a) Continuous b) Discontinuous [ ]

c) Continuous and also Discontinuous d) Continuous only for certain firing angles

17. A single phase semi converter input power factor is….to full converter [ ]

a) High b) Low c) Same d) High or low

18. In any converter whether the waveform is continuous or discontinuous depends on [ ]

a) Firing angle only b) Extinction angle only

c) Time constant of load circuit

d) Firing angle, Extinction angle, Time constant of load circuit

19. A single phase semi converter with RL load. the current waveform can be [ ]

a) Continuous b) Discontinuous

c) Continuous and Discontinuous d) Can’t be determined

KEY: 1-C, 2-C, 3-A, 4-B, 5-D, 6-C, 7-B, 8-D, 9-D, 10-A, 11-C, 12-B, 13-A, 14-D, 15-B, 16-B, 17-A, 18-D, 19-C

1. A single-phase two-pulse converter has an average output voltage and power output of 500v

and 10kw respectively. The tyristor used in the two-pulse bridge converter are now re-  
employed to form a single -phase two pulse midpoint converter. The new controlled

converter would give, respectively an average output voltage and power output of [ ]

a.500v, 10kw b.250v, 5kw c.250v, 10kw d.500V, 5kw

2. A 1- Ø two pulse converter has an average output voltage and power output of 250V and

5kw respectively. The thyristor used in the two-pulse bridge converter are now- reemployed to form a single-phase two pulse midpoint converter. The new controlled converter would give respectively an average at output voltage and power output of

a.250V, 5kw b.125V, 2.5kw c.125v, 5kw d.500v, 5kw [ ]

3. A single-phase full wave mid-point thyristor converter used a 230/200v transformer with

centre tap on the secondary side. The PIV for each thyristor

a.100 b.141.4 c.200 d.282.8 [ ]

4. A Single-phase full wave mid-point thyristor converter uses400/200V transformer with

centre tap on the secondary side. The PIV for each thyristor [ ]

a.100 b.141.4 c.200 d.282

5. A single Phase full wave mid-point thyristor converter used 230/100v transformer with

centre top on the secondary side. The PIV for each thyristor is [ ]

a.100 b.70.7 c.100 d.141.2

6. The secondary rms voltage of center tapped transformer used in midpoint configuration of

fully converter is 2Vs. Then the PIV of each SCR is [ ]

a. 2Vs b. Vs/2 c. Vs d. 2Vs

7. The major advantage of fully controlled converter over semi converter is [ ]

a.Power factor improvement b.Internal freewheeling action

c.Single quadrant operation d.Two quadrant operation

8. Which one of the following converter can give both positive and negative average voltages

a.1-φ full converter b.1-φ half wave converter [ ]

c.1-φ semi converter d.1-φ half wave and semi converter

9. No. of SCRs used in 1-φ full converter with midpoint configuration [ ]

a. 1 b. 2 c. 3 d. 4.

10. A 1-φ fully controlled converter is connected to a 200sin 314t voltage supply. Its output is   
 fed to a load resistance of 10 and inductance 2H. The expression of transient current is

a. Ae -5t b. Ae-t20 c. Ae- 40t d. Ae -3t [ ]

11. In a single phase full converter with RL load, firing angle is 300 and its giving continuous

mode of operation. The conduction angle of each SCR is [ ]

a. 300 b. 1500 c. 1800 d. 600

12. The input source frequency of fully controlled converter is F. the frequency of output of the

converter is [ ]

a. F b. 2F c. 3F d. 4F

13. Which of the following converter can give regenerative operation [ ]

a. 1-φ half wave converter with R load b. 1-φ fully controlled converter with RL load

c. 1-φ semi converter with R load d. 1-φ fully controlled converter with RLE load

14. In controlled rectifiers, the nature of load current [ ]

a. Does not depend on type of load and firing angle delay

b. Depends both on the type of load and firing angle delay

c. Depends only on the type of load d. Depends only on source voltage

15. A1-φ fully controlled converter can give [ ]

a. First quadrant of operation only b. Second quadrant of operation only

c. First and fourth quadrants d. All the four quadrants of operation

16. A 1-φ fully controlled converter needs (Bridge configuration) [ ]

a. 2SCRs b. 4SCRs c. 1SCRs d. 5SCRs

17. Pulse number of a 1-φ fully controlled converter [ ]

a. 1 b. 2 c. 3 d. 4

18. How many full converters are needed to get all the quadrants of operation for the drive

a. 1 b. 2 c. 3 d. 4 [ ]

19. In a full converter with RL load SCR can conduct even during negative cycle of source

voltage majority due to [ ]

a. Resistance b. Firing angle c. Inductance d. Resistance and inductance

20. A single phase full converter is operating with RL load. The average output voltage across

the inductance is [ ]

a. VS b. V/2 c. ZERO d. 2VS

KEY: 1-B, 2-B, 3-D, 4-D, 5-D, 6-D, 7-D, 8-A, 9-B, 10-A, 11-C, 12-B, 13-D, 14-B, 15-C, 16-B,   
 17-B, 18-B, 19-C, 20-D

1. Each diode of a 3-phase half-wave diode rectified conducts for [ ]

a. 600 b 120 c. 1800 d. 900

2. Each diode of a 3-phase bridge diode rectified conducts for [ ]

a. 600 b. 120 c. 1800 d. 900

3. In a 3-phase half-wave diode rectified, if per phase input voltage is 200 V, then the average

output voltage is [ ]

(a) 233.91V (b) 116.95 V (c) 202.56 V (d) 101.28V

4. In a 3-phase half-wave rectified, dc output voltage is 230 V. The peak inverse voltage

across each diode is [ ]

a. 481.7 V b. 460V c. 345 V d. 230 V

5.. In a 3-phase full wave diode rectified, the peak inverse voltage in terms of average output

voltage is

a. 1.571 b. 0.955 c. 1.047 d. 2.094 [ ]

6. In a 3-phase half - wave diode rectified, if Vmp is the maximum value of per phase voltage,

then each diode is subjected to a peak inverse voltage of [ ]

a. Vmp b. c. 2Vmp d. 3Vmp

7. In a 3-phase full-wave diode rectified, if Vml is the maximum value of the line voltage, each

diode is subjected to a peak inverse voltage is [ ]

a. Vml b. c. 2Vml d. 3Vml

8. In a 3-phase full-wave diode rectifier , if V is the per phase input voltage, then average

output voltage is given by [ ]

a. 0.955 V b. 1.35 V c. 2.34 V d. 3 V

9. A converter which can operate in both 3-pulse and 6-pulse modes is a [ ]

a. 1-phase full converter b. 3-phase half-wave converter

c. 3-phase semi converter d. 3-phase full converter.

10. In a 3-phase semi-converter, for firing angle less than or equal to 600, each thrystor and

diode conduct, respectively, for [ ]

a. 600, 600 b. 900, 300 c 1200, 1200 d. 1800, 1800

11. In a 3-phase semi converter, for firing angle less than or equal to 600 freewheeling diode

conducts for [ ]

a. 300 b. 600 900 d. zero degree

12. In a 3-phase semi converter, for a firing angle equal to 900 and for continuous conduction,

each SCR and diode conduct respectively, for [ ]

a. 300, 600 b. 600 300 c. 900, 900 d. 300 300

13. In a 3-phase semi converter, for a firing angle equal to 900 and for continuous conduction,

freewheeling diode conducts for [ ]

a. 300 b. 600 c. 900 d. Zero degree

14. In a 3 - phase semi converter, for firing angle equal to 1200 and extinction angle equal to

1100, each SCR and diode conduct, respectively, for [ ]

a. 300, 600 b. 600, 600 c. 900, 300 d. 110, 300

15. In a 3-phase semi converter, for firing angle equal to 1200 and extinction angle equal to

1100, free wheeling diode conducts for [ ]

a. 100 b. 300 c. 500 d. 110

16. In a 3-phase semi converter, for firing angle equal to 120 and extinction angle equal to

1000, none of the bridge elements conduct for [ ]

a. 100 b. 200 c. 300 d. 600

17. A 3-phase semi converter can work as [ ]

a. Converter for α =00 to 1800 b. Converter for α = 00 to 900

c. inverter for α =900 to 1800 d. Inverter for α = 00 to 900

18. In a 3-phase semi converter, the three SCRs are triggered at an interval of [ ]

a. 600 b. 900 c. 1200 d. 1800

19. In a 3-phase full converter, the six SCRs fired at an interval of [ ]

a. 300 b. 600 c. 900 d.1200

KEY: 1-B, 2-B, 3-A, 4-A, 5-C, 6-B, 7-A, 8-A, 9-C, 10-C, 11-D, 12-C, 13-A, 14-B, 15-C,   
 16-B, 17-A, 18-C, 19-B

**UNIT-III**

**DC-DC CONVERTERS (CHOPPERS)**

1. In dc choppers, if Ton is the on-period and f is the chopping frequency, then output voltage in

terms of input voltage VS is given by [ ]

a. Vs .Ton/f b. Vs.f/Ton c. Vs/f.Ton d. Vs.f.Ton

2. In dc choppers, the waveforms for input and output voltages are respectively [ ]

a. Discontinuous, continuous b. both continuous

b. c. both discontinuous d. continuous, discontinuous

3. A chopper can be used on [ ]

a. Pulse-width modulation only b. Frequency modulation only

c. amplitude modulation only d. both PWM and FM

4. In PWN method of controlling the average output voltage in a chopper, [ ]

1. On-time Ton is varied and chopping frequency f is kept constant

2. Ton is kept constant and f is varied

3. Both Ton and off-time Toff are varied and f is kept constant

4. Toff is varied and T is kept constant

From above, the correct statements are

a. 1,3 b. 1,3,4 c. 2,3,4 d. 3,4.Tech III Year I Sem Course File

5. In FM method of controlling the average output voltage in a chopper, [ ]

1. On-time Ton is kept constant and chopping period T is varied

2. Turn off time Toff is kept constant and T is varied

3. Ton is kept constant and Toff is varied

4. Toff is kept constant and Ton is varied   
 From there the correct statements are

a. 1,3,4 b. 2,3,4 c. 1,2,3,4 d. 1,2,3

6. A. Step-down chopper is operated in the continuous conduction mode in steady state with a

constant duty ratio D . If V0 is the magnitude of the dc output voltage and if Vs is the

magnitude of the dc output voltage, the ratio V0/Vs is given by [ ]

a. D b. 1-D c. d.

7. For type-A chopper, Vs is the source voltage, R is the load resistance and α is the duty cycle.

The average output voltage and current for this chopper are respectively [ ]

a. α Vs, α.(Vs/R) (b) (1-α)Vs, (1-α) Vs/R c. Vsα/, Vs/αR d. Vs/(1-α), Vs/(1-α)R

8. For type-A chopper, Vs as the source voltage, r as the load resistance and α as the duty cycle.

For this chopper, Rms value of output voltage is [ ]

a. αVs b. . Vs c. Vs/ d. .Vs

9. In dc choppers, per unit ripple is maximum when duty cycle α is [ ]

a. 0.2 b. 0.5 c. 0.7 d. 0.9

10. A load commutated chopper, fed from 200 V dc source, has a constant load current of 50 A.

For a duty cycle of 0.4 and chopping frequency of 2 kHz, the value of commutating capacitor

and the turn-off time for one thyristor pair are respectively [ ]

(a) 25µ F, 100µs b. 50µ F, 50µs c. 25µ F, 25µs d. 50µ F, 25µs

11. A dc battery is charted from a constant dc source of 200 V through a chopper. The dc battery

is to be charged from its internal emf of 90 to 120 V. The battery has internal resistance of 1 Ω.

For a constant charging current of 10A the range of duty cycle is [ ]

a. 0.45 to 0.6 b. 0.5 to 0.65 c. 0.4 to 0.55 d. 0.5 to 0.6

12. For type-A chopper: Vs R, I0 and α are respectively the dc source voltage, load resistance,

constant load current and duty cycle. For this chopper, average and rms [ ]

a. αI0, , I0  b. (1-α)I0, . I0 c. α.Vs/R, Vs/R d. (1-α) I0, .I0

13. A step-up chaopper has Vs as the source voltage and α as the duty cycle. The output voltage

for this chopper is given by [ ]

a. Vs (1+α) b. Vs/(1-α) c. Vs(1-α) Vs/(1+α)

14. A dc chopper is fed from 100 V dc. Its load voltage consists of rectangular pulses of duration

1 msec in an overall cycle time of 3 msec. The average output voltage and ripple factor for

this chopper are respectively [ ]

a. 25 V, 1 b. 50 V, 1 c. 33.33 V, d. 33.33 V, 1

15. When a series LC circuit is connected to a dc supply of V volts through a thyristor then the

peak current through thyristor is [ ]

a. V. b. V/ c. V. d. V.

16. In type-A chopper, source voltage is 100 V dc, on-period = µs, off-period=150µs and load

RLE consists of R= 2Ω, L=5 mH, E=10V. For continuous conduction, average output current

for this chopper are respectively [ ]

a. 40 V, 15 A b. 66.66 V, 28.33 A c. 60 V, 25 A d. 40 V , 20 A

17. A step-up chopper is fed from a 220 V dc to deliver a load voltage of 660 V. If the non-

conduction time of the thyristor is 100 µs, the required pulse width would be [ ]

a. 100 µs b. 200 µs c. 220 µs d. 660 µs

18. A chopper, where voltage as well as current remains negative, is known as [ ]

a. Type-A b. Type-B c. Type-C d. Type-D

19. A chopper, in which current remains positive but voltage may be positive or negative, is

known as

a. Type-A b. Type-B c. Type-C d. Type-D [ ]

20. For eliminating fifth harmonic from the output voltage wave of a dc chopper, the ripple factor

should be [ ]

a. 1 b. 2 c.3 d. 4

KEY: 1-D, 2-D, 3-D, 4-B, 5-C, 6-A, 7-A, 8-B, 9-B, 10-A, 11-B, 12-B, 13-B, 14-C, 15-C, 16-A, 17-B, 18-B, 19-D, 20-B

**UNIT-IV**

**AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS**

1. Single-phase voltage controller feeds an induction motor (A) and a heater (B) [ ]

a. In both the loads, fundamental and harmonics are useful

b. In A only fundamental and in B only harmonics are useful

c. In a only fundamental and in B harmonics as well as fundamental are useful

d. In a only harmonics and in B only fundamental are useful

2. A load resistance of 10Ω is fed through a 1-phase voltage controller from a voltage source of

200 sin 314t. For a firing a angle delay of 900 the power delivered to load in kW, is [ ]

a. 0.5 b. 0.75 c. 1 d. 2.

3. A single-phase voltage controller is employed for controlling the power flow from 260V, 50Hz

source into a load consisting of R=5Ω and ωL=12Ω. The value of maximum rms load current

and the firing angle are respectively [ ]

a. 20A, 00 b. , A, 00 c. 20A, 900 d.

4. A load, consisting of R=10Ω and ωL=10Ω, is being fed from 230V, 50Hz, source through a 1-

phase voltage controller. For a firing angle delay of 300, the rms value of load current would be

a. 23 A b. c. > d. < [ ]

5. In a single-phase voltage controller with RL load, ac output power can be controlled if

a. firing angle α>φ (load phase angle and conduction angle γ=π [ ]

b. α > φ and γ < π c. α< φ and γ < π d. α > φ and γ > π

6. A single-phase voltage controller feeds power to a resistance of 10Ω. The source voltage is 200

V rms. For a firing angle of 900, the rms value of thyristor current in amperes is [ ]

a. 20 b. 15 c. 10 d. 5

7. A single-phase voltage controller is connected to a load of resistance 10 Ω and a supply of 200

sin 314t volts. For a firing angle of 600, the average thyristor current in amperes is [ ]

a.10 b. 10/π c. 5 d. 5

8. A single-phase voltage controller, using two SCRs in antiparallel, is found to be operating as a

controlled rectifier. This is because [ ]

a. load is r and pulse gating is used b. load is R and high-frequency carrier gating is used

c. Load is RL and pulse gating is used d. load is RL and continuous gating is used

9. a single-phase ac voltage controller (or regulator) fed from 50Hz system supplies a load having

resistance and inductance of 2.0 Ω and 6.36 mH respectively. The control range of firing angle

for this regulator is [ ]

a. 00 < α < 1800 b. 450 < α < 1800 c. 900 < α < 1800 d. 00 < α < 450

10. Two identical SCRs are connected back to back in series with a load. If each SCR is fired at

600, a PMMC voltmeter across the load would read [ ]

a. peak voltage b. x peak voltage c. zero d. x peak voltage

11.A cycloconverter is a frequency converter from [ ]

a. Higher to lower frequency with one-stage conversion

b. Higher to lower frequency with two-stage conversion

c. Lower to higher frequency with one-stage conversion

d. Ac to one frequency to dc and then dc to ac at a different frequency From these, the correct statements are

(a)2,4 (b) 1 only (c) 2,3 (4) 1,3

12The cycloconverters (CCs) re quire natural or forced commutation as under: [ ]

a. Natural commutation in both step-up and step-down CCs

b. Forced commutation in both step-up and step down CCs

c. Forced commutation in step-up CCS d. Forced commutation in step-down CCs

13.Consider the following statements regarding cycloconverters [ ]

1. In 1-phase to 1-phase CC, firing angle may be varied

2. In 3-phase to 1-phaseCC, firing angle may be kept constant

3. In 1-phase to 1-phase CC, firing angle may be kept constant

4. In 3-phase to 1-phase CC, firing angle may be varied

5. In 3-phase to 1-phaseCC, firing angle mast be varied From these, the correct statements are

(b) 2,4,5 (b) 1,3,5 (c) 2,3,5 (d) 2,3,4

14. Three-phase to three-phase cycloconvers employing 18 SCRs and 36 SCRs have the same   
 voltage and current rating for their component thyristors. The ratio of VA rating of 36-SCR

device to that of 18-SCR device is [ ]

a. ½ b. 1 c. 2 d. 4

15. Three-phase to 3-phase cycloconverters employing 18 SCRs and 36 SCRs have the same

voltage and current rating for their component thyristors. The ratio of power output from 36-

SCR converter to that out patted by 18-SCR converter is [ ]

a. 4 b. 2 c. 1 d. ½

16. The number of thyristors required for single-phase to single-phase cycloconverter of the mid-

point type and for three phase to three-phase to three-phase 3-pulse type cycloconverter are

respectively

(a)4,6 b. 8, 18 c. 4,18 d. 4,36 [ ]

17. A 3-phase to single-phase conversion device employs a 6-pulse bridge cycloconverter. For an

output voltage of 200 V per phase the fundamental rms value of output voltage is [ ]

a. 600/π V (b) 300 / π V c. 300/π V d. 600 / π V

18. A three-phase to single-phase cycloconverter consists of positive and negative group of

converters. In this device one of the two component converters would operate as a [ ]

1. Rectifier if the output voltage V0 and I0 have the same polarity

2. Rectifier if V0 and I0 have the same polarity

3. Rectifier if V0 and I0 are of opposite polarity

4. Inverter if V0 and I0 are opposite polarity   
From above, the correct statements are

a) 1,4 b. 2,3 c. 3,4 d. 1,2

19. A 3-phase to 3-phase cycloconverter requires [ ]

1. 18 SCRs for 3-pulse device

2. 18 SCRs for 6-pulse device

3. 36 SCRs for 3-pulse device

4. 36 SCRs for 6-pulse device

From above, the correct statements are

a) 1,3 b. 2,3 c. 2,4 d. 1,4

20. Which of the following statements are correct for cycloconverters? [ ]

1. Step-down cycloconverter (cc) works on natural commutation

2. Step-up cc requires forced commutation

3. Load commutated cc works on line commutation

4. Load commutated cc requires a generated emf in the load circuit From above, the correct statements are

a) 1,2 b. 1, 2,4 c. 2,3, 4 d. 1,2,3

KEY: 1-C, 2-C, 3-A, 4-B, 5-B, 6-C, 7-B, 8-C, 9-B, 10-C, 11-D, 12-C, 13-B, 14-C, 15-A, 16-C,

17-D, 18-A, 19-D, 20-B

**UNIT-V**

**INVERTERS**

1. If, for a single-phase half-bridge inverter, the amplitude of output voltage is Vs and the

output power is P, then their corresponding values for a single-phase full-bridge inverter are

a. Vs, P b. 2Vs’ P c. 2Vs’ 2P d. 2Vs’ 4P [ ]

2. In voltage source inverters [ ]

a. Load voltage waveform V0 depends on load independence Z, whereas load current   
 waveform i0 does not depend on Z

b. Both V0 and i0 depend on Z

c. V0 does not depend on Z whereas i0 depends on Z

d. Both V0 and i0 do not depend upon Z

3. A single-phase full bridge inverter can operate in load-communication mode in case load

consists of [ ]

a. RL b. RLC under damped c. RLC over damped d. RLC critically damped

4. A single-phase bridge inverter delivers power to a series connected RLC load with R= 2Ω ,

ωL=8Ω. For this inverter-load combination, load commutation is possible in case the

magnitude of 1/ωC in ohms is [ ]

a. 10 b. 8 c. 6 d. zero

4. For a 3-phase bridge inverter in 1800 conduction mode, Fig C.50, the sequence of SCR

conduction in the first two steps, beginning with the initiation of thyristor 1 is [ ]

a. 6,1,2 and 2,3,1, b. 2,3,1 and 3,4, 5 c. 3,4,5 and 5,6,1 d. 5,6,1 and 6,1,2

5. For a 3-phase bridge inverter in 1200 conduction mode Fig. C. 50, the sequence of SCR

conduction in the first two steps, beginning with the initiation of thyristor 1, [ ]

a. 6,1 and 1,2 b. 1,2 and 2,3 c. 1,6 and 5,6 d. 1,3 and 3,4

6. In single-pulse modulation of PWM inverters, third harmonic can be eliminated if pulse

width is equal to [ ]

a. 300 b. 600 c. 1200 d 1500

7. In a single-pulse modulation of PWM inverters, fifth harmonic can be eliminated if pulse

width is equal to [ ]

a. 300 b. 720 360 d. 1080

8. In a single-pulse modulation of PWM inverters, the pulse width is 1200. For an input

voltage of 220 V dc, the r.m.s. value of output voltage is [ ]

a. 179.63 V b. 254.04 V c. 127.02 V d. 185.05 V

9. In a single-pulse modulation used in PWM inverters, Vs is the input dc voltage. For

eliminating third harmonic, the magnitude of rms value of fundamental component of

output voltage and pulse width are respectively [ ]

10. In multiple-pulse modulation used in PWM inverters, the amplitudes of reference square

wave and triangular carrier wave are respectively 1V and 2V. for generating 5 pulses per

half cycle, the pulse width should be [ ]

a. 360 b. 240 c. 180 d. 120

11. In multiple-pulse modulation used in PWM, the amplitudes and frequency for triangular

carrier and square reference signals are respectively 4V , 6kHz and 1V, 1KHz. The number

of pulses per half cycle and pulse width are respectively [ ]

a. 6, 900 b. 3, 450 c. 4, 600 d. 3, 400

12. In sinusoidal-pulse modulation used in PWM inverters, amplitude and frequency for

triangular carrier and sinusoidal reference signals are respectively 5V, 1kHz and 1V, 50

Hz. If zeros of the triangular carrier and reference sinusoid coincide, then the modulation

index and order of significant harmonics are respectively [ ]

a. 0.2, 9 and 11 b. 0.4, 9 and 11 c. 0.2, 17 and 19 d. 0.2 and 21

13. Which of the following statement/statements is/are correct in connection with inverters

a. VSI and CSI both require feed back diodes [ ]

b. Only CSI requires feedback diodes

c. GTOs can be used in CSI

d. Only VSI requires feedback diodes.

14. In a CSI, if frequency of output voltage is f Hz , then frequency of voltage input to CSI is

a. f b. 2f c. f/2 3f [ ]

15. In sinusoidal-pulse modulation used in PWM inverters, amplitude and frequency of

triangular carrier and sinusoidal reference signals are respectively 5V, 1kHz and 1V, 50 Hz.   
If peak of the triangular carrier coincides with the zero of the reference sinusoid, then the

modulation index and order or significant harmonics are [ ]

a. 0.2, 9 and 11 b. 0.4, 9 and 11 c. 0.2, 17 and 19 d. 0.2, 19 and 21

16. In sinusoidal PWM, there are ‘m’ cycles of the triangular carrier wave in the half cycle of

reference sinusoidal signal. If zero of the reference sinusoid coincides with zero/peak of the

triangular carrier wave, then number of pulses generated in each half cycle are respectively

a. (m-1)/m b. (m-a)/(m-1) c. m/m d. m/(m-1) [ ]

17. In an inverter with fundamental output frequency of 50 Hz, if third harmonic is eliminated,

then frequencies of other components in the output voltage wave, in Hz, would be [ ]

a. 250, 350, 450, high frequencies b. 50,250, 350, 450

c. 50,250, 350, 550 d. 50,100,200,250

18. A single-phase CSI has capacitor C as the load. For a constant source current, the voltage

across the capacitor is [ ]

a. Square wave b. Triangular wave c. step function d. pulsed wave

19. A single phase full bridge VSI has inductor L as the load. For a constant source voltage, the

current through the inductor is [ ]

a. Square wave b. Triangular wave c. step function d. pulsed wave

KEY: 1-D, 2-C, 3-B, 4-A, 5-D, 6-A, 7-C, 8-B, 9-A, 10-D, 11-C, 12-B, 13-C, 14-D, 15-B, 16-D, 17-A, 18-C, 19-B.