Assignment 2-I.E.C.D. (4th Sem. EE)

Fill-in the Blanks

1. A device which converts dc power into ac power at desired voltage and frequency is called __.
2. Variable voltage fixed frequency supply is obtained by _____.
3. The main application of the self-commutation process is found in _____.
4. The series inverters are also known as _____ commutated inverters.
5. The series inverter uses _____ type of commutation.
6. The parallel inverters are also known as _____ commutated inverters.
7. SCR inverters usually have _____ power rating in comparison to the transistor inverter.
8. In a series inverter, the elements R, L, C must form a _____.
9. The maximum frequency of series inverter is restricted to the _____.
10. Output waveforms of a parallel inverter can be improved by using _____.
11. A class E chopper can operate in ____ quadrants.
12. A step-up chopper produces _____ voltage at the load.
13. A chopper is a _____ converter.
14. _____ cycle of a dc chopper circuits controls the load voltage.
15. The main application of cyclo-converter circuit is found in _____.
16. A cyclo-converter converts input power at one frequency to _____.
17. To produce one half frequency at the output _ configurations of a cyclo-converter is preferred.
18. A single-phase mid-point cyclo-converter has ___ pulses.
19. The variable frequency ac supply available at the output of the cyclo-converter circuit may be fed to the motor for its speed control. True/False
20. A cyclo-converter is a group of _____.

Short/Long Answer Questions

1. What is Inverter. What are its different types?
2. With the help of block diagram and circuit diagram explain the working of an inverter.
3. Discuss the working principle of a series inverter with the help of a circuit diagram. Also write its applications and limitations.
4. Explain the working of a parallel inverter with the help of a circuit diagram. Also write its applications.
5. What is chopper? What are its Applications? Discuss various types of choppers.
6. Explain the working principle of step-up and step-down choppers.
7. Why dual converter is called so? Discuss the working of single-phase dual converter with circuit diagram.
8. What is cyclo-converter? What are its applications? Why is it suitable for low frequency only?
9. Explain working of Cyclo-converter using centre-tapped transformer.
10. Explain working of Single-phase cyclo-converter.

Assignment 3-I.E.C.D. (4th Sem. EE)

1. What is electric drive? Write key advantages of electric drives.
2. Discuss a scheme for control of armature voltage and field current of a DC motor.
3. Explain briefly following DC motor drives
   (i) Single-phase half-wave converter drives
   (ii) Single-phase semi converter drives
   (iii) Single-phase full-converter drives
4. Discuss the speed control of dc motors by using dual converters.
5. Explain the circuit diagram of a dc chopper scheme for speed control of dc series and shunt motor.
6. What are the main advantages and disadvantages of AC drives?
7. Distinguish between ac and dc drive.
8. Explain the following speed control methods of 3-phase induction motors:
   (i) Stator voltage control
   (ii) Stator frequency
   (iii) Stator voltage & frequency control
9. Explain the basic scheme for control of 3-phase induction motor using dual converter.
10. Explain the closed loop drive of a slip ring induction motor using chopper.
11. Explain Slip Power recovery scheme of an induction motor in detail.
12. Discuss how the speed of a synchronous motor be controlled using closed loop control of a voltage source inverter.
13. Explain speed control of a single-phase induction motor by:
    (i) Using fixed frequency variable voltage control method.
    (ii) Using cyclo-converter.
14. Explain with the help of a circuit diagram the scheme for speed control of a universal motor.

IECD Seminar Topics (Jan-May 2020)

S. No.	Seminar Topic	Roll No.
1.	1. What do you mean by controlled rectifier? Why a fully controlled converter is called so? 2. Why a free-wheeling diode is called so? 3. Single-phase half-wave controlled rectifier. 4. Single-phase fully-controlled centre-tapped rectifier.	81-87
2.	1. Single-phase fully-controlled bridge rectifier 2. Three-phase full-wave fully-controlled bridge rectifier	88-92
3.	1. Series Inverter: Working principle, circuit diagram, applications, limitations 2. Parallel Inverters: Working principle, circuit diagram, applications	93-100
4.	Choppers: Different types, details of step-up and step-down choppers, applications.	101-109
5.	Dual converter: Different types, details of single-phase dual converter, applications.	110-118
6.	1. Cyclo-converter: Different types, details of single-phase, using centre-tapped transformer, applications. 2. Why cyclo-converters are suitable for low frequency only?	119-127
7.	UPS- block diagram, back-up time, factors which can increase back-up time, detailed working	128-134
8.	ON-line, OFF-line and Line-interaction UPS	136-143
9.	Storage devices (batteries) used in UPS. Criteria of selection of battery for a given UPS.	145-150
10.	Care and maintenance of batteries is done. Advantages and disadvantages of lead-acid batteries. Why sealed maintenance free batteries are preferred over lead acid batteries?	151-155
11.	Application of SCR • in automatic battery charger • for speed control of dc motor	156-160

IECD You Tube Links

POWER ELECTRONICS

https://nptel.ac.in/courses/108102145/

FUNDAMENTALS OF POWER ELECTRONICS

https://nptel.ac.in/courses/108101126/

FUNDAMENTALS OF ELECTRIC DRIVES

https://nptel.ac.in/courses/108104140/

IECD Topics

Converter Circuit (Ref. Power Electronics Book by Ashfaq Ahmed)

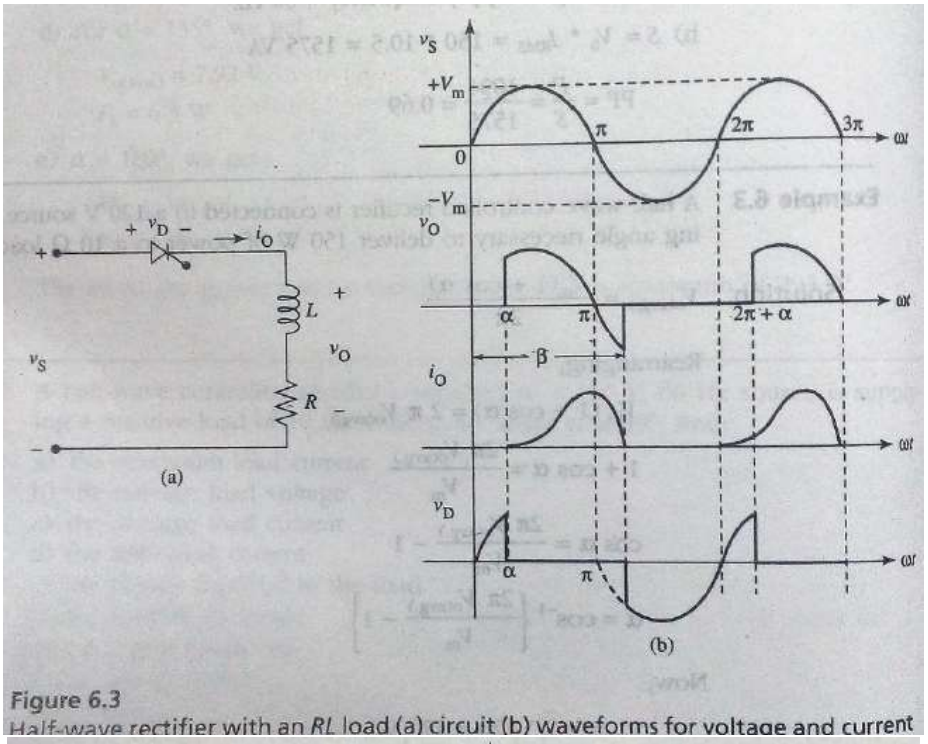


Figure 6.3
Half-wave rectifier with an *RL* load (a) circuit (b) waveforms for voltage and current

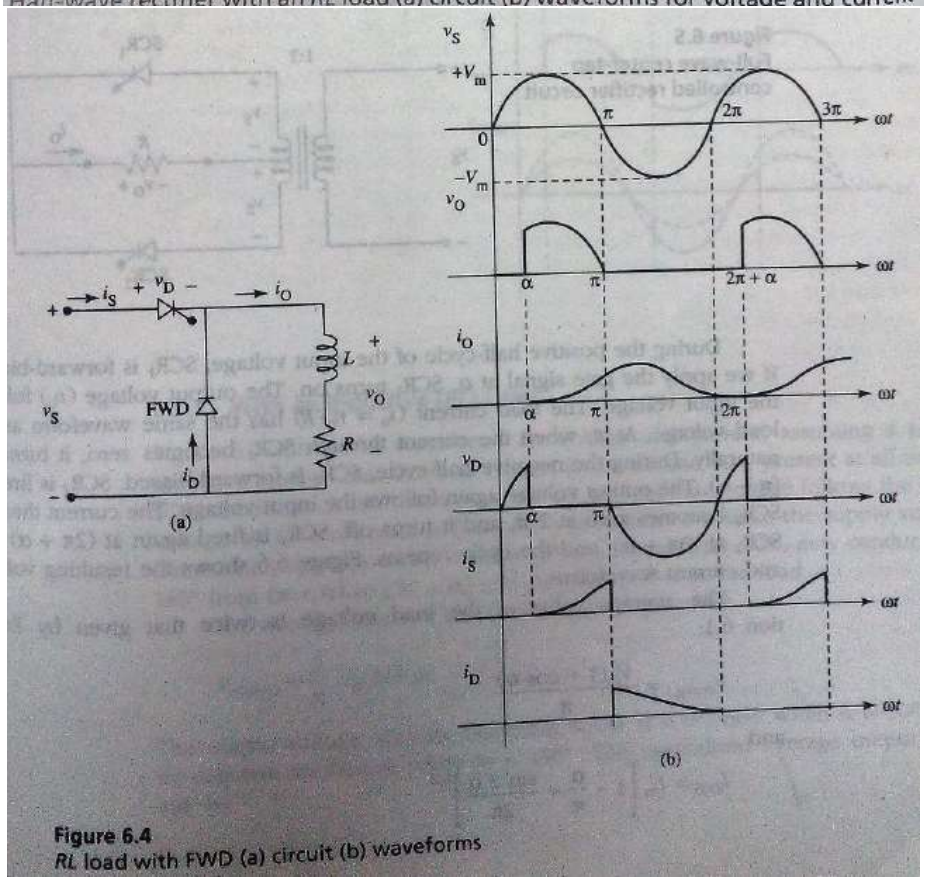


Figure 6.4
RL load with FWD (a) circuit (b) waveforms

Figure 6.5
Full-wave center-tap controlled rectifier circuit

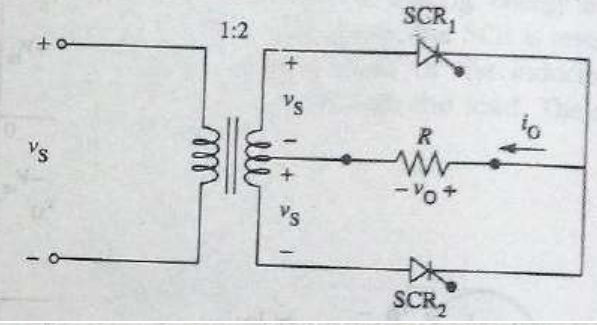
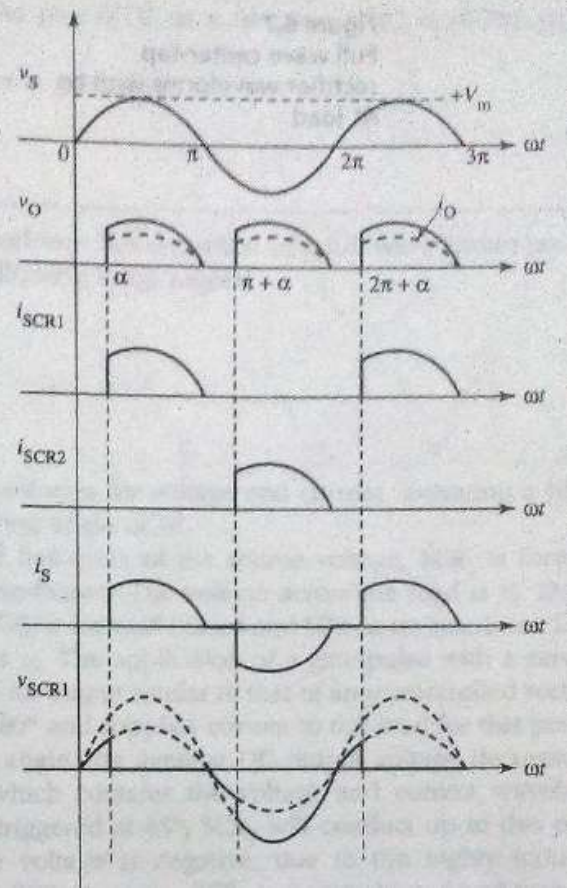


Figure 6.6
Full wave center-tap rectifier waveforms with a resistive load



Basic Chopper Circuit (Ref. Power Electronics Book by Ashfaq Ahmed)

Figure 9.1
Basic DC chopper

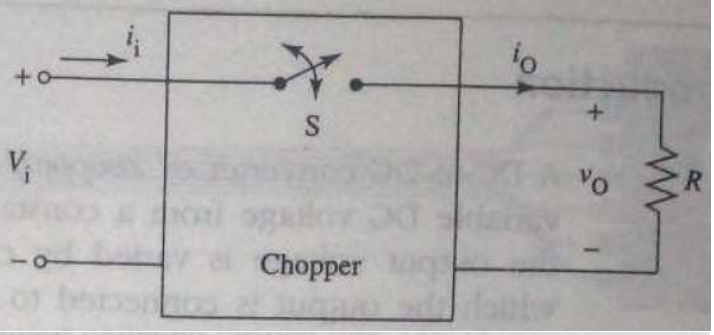
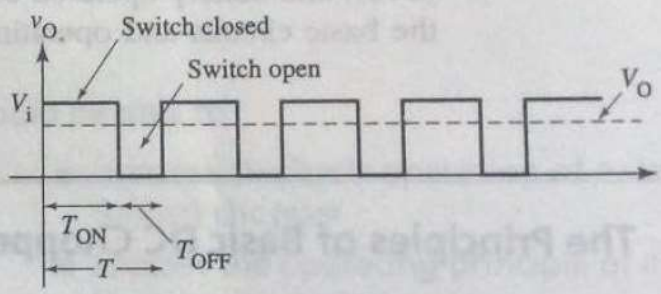


Figure 9.2
Waveform of v_0 for Figure 9.1



Basic Inverter Circuit (Ref. Power Electronics Book by Ashfaq Ahmed)

Figure 10.1
Basic circuit for half-bridge inverter

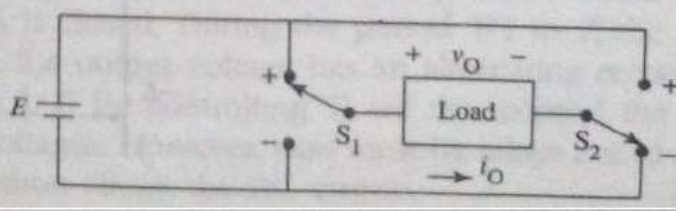
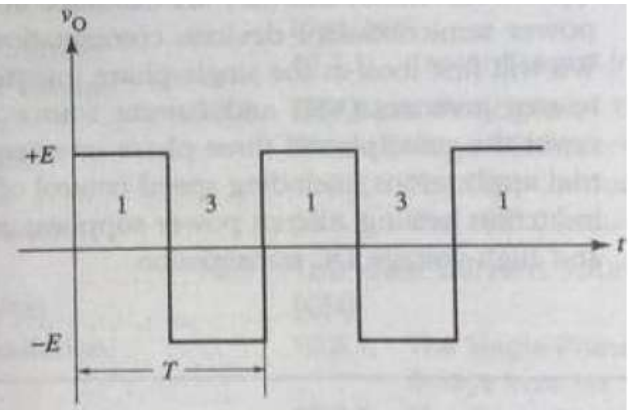


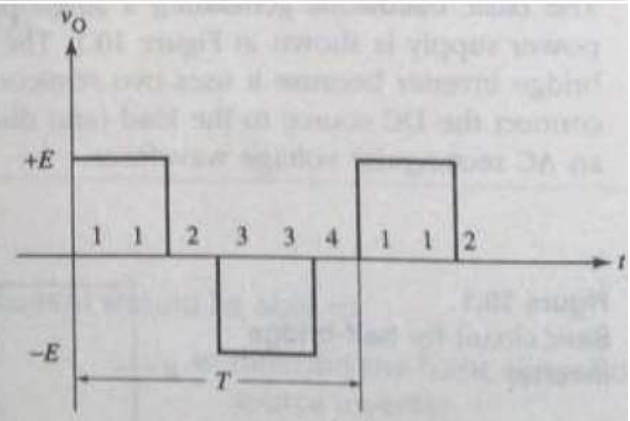
Table 10.1

State	S_1	S_2	Output voltage
1	+	−	$+E$
2	−	−	0
3	−	+	$-E$
4	+	+	0

Figure 10.2
Switching sequence in the H-bridge inverter (a) square-wave output (b) step-wave output



(a)



(b)

Cycloconverter Circuit (Ref. Power Electronics Book by P.S. Bimbhra)

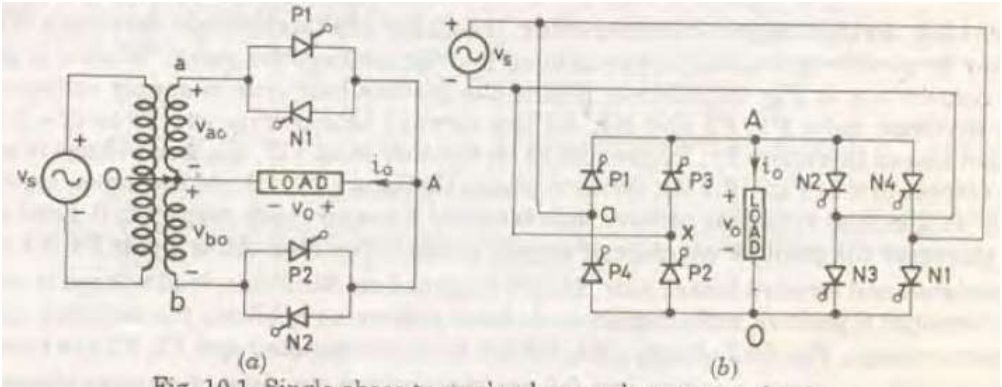


Fig. 10.1. Single-phase to single-phase cycloconverter circuit (*a*) mid-point type and (*b*) bridge type.

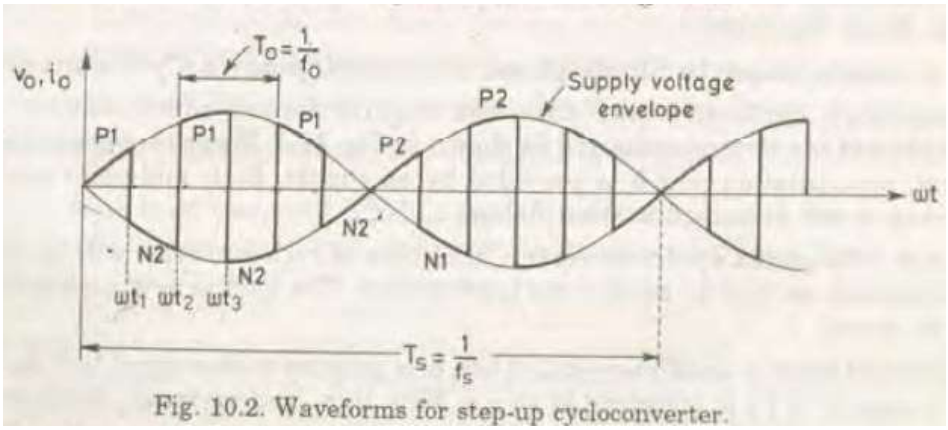


Fig. 10.2. Waveforms for step-up cycloconverter.

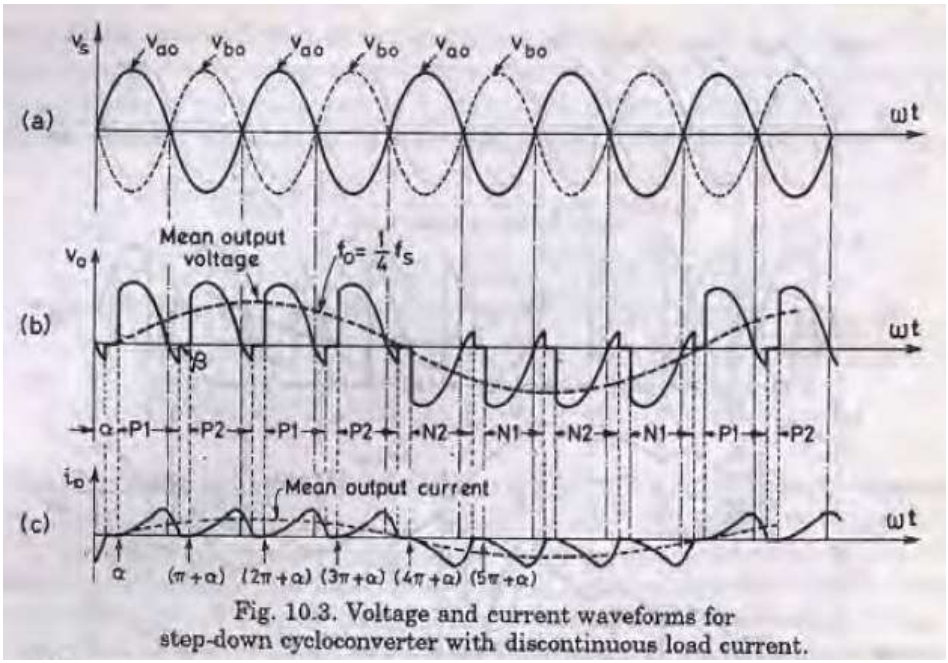


Fig. 10.3. Voltage and current waveforms for step-down cycloconverter with discontinuous load current.

HVDC (Ref. Power Electronics Book by P.S. Bimbhra)

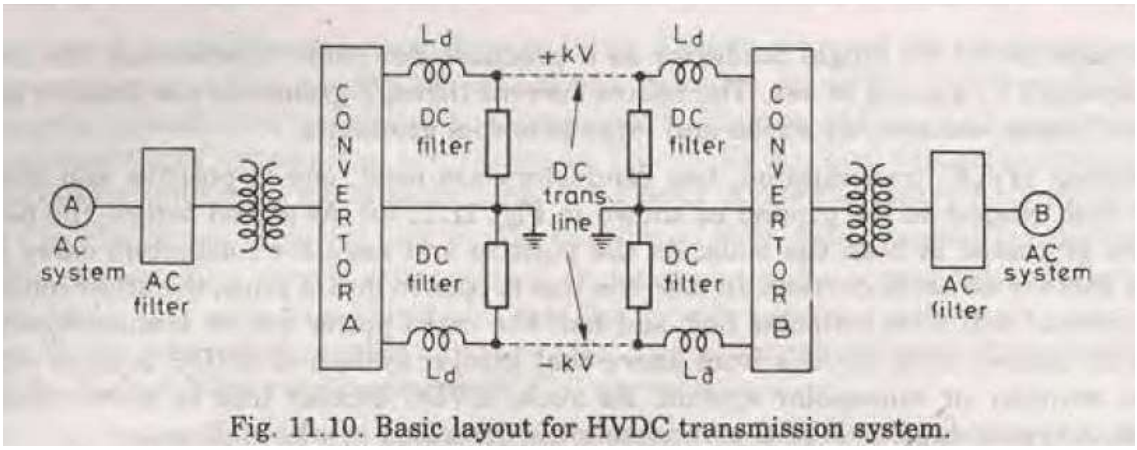


Fig. 11.10. Basic layout for HVDC transmission system.

HVDC (Ref. HVDC & FACTS Controllers Book-V. K. Sood)

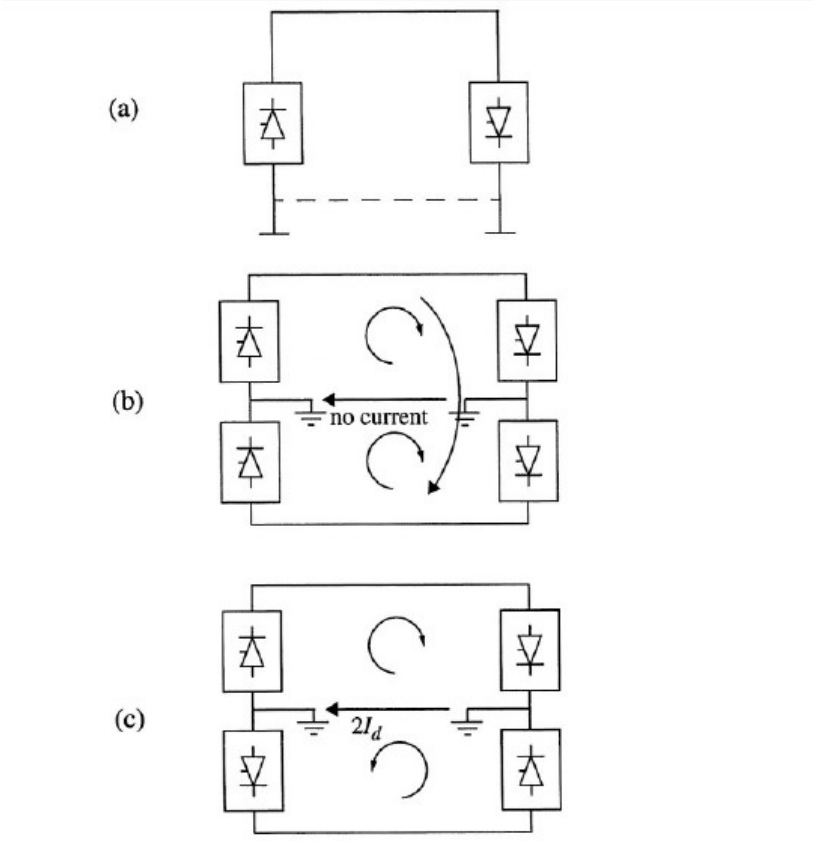


Figure 1-3: Types of HVDC links (a) monopolar link (b) bipolar link and (c) homopolar dc link

UPS (Ref. Article Titled "Uninterruptible power supply systems provide protection" by J.M. Gurrero, Luis Garcia de Vicuna and Javier Uceda, published in February 2007 issue of IEEE Industrial Electronics Magazine, page no. 28 - 38

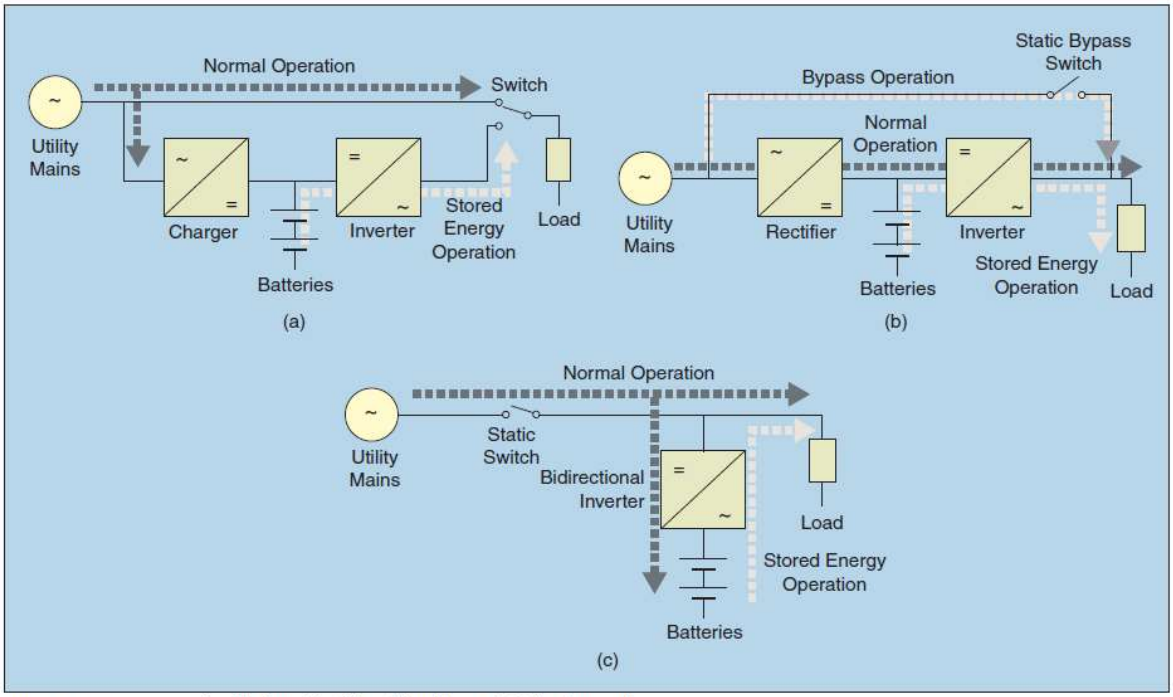


FIGURE 5 — UPS system classification: (a) offline, (b) online, and (c) line interactive.