Power Electronics

Date 28/04/21
Page

ASSIGNMENT - 5

ABCA ACTIVITY - 8th

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1. Voltage Source Inverter

The voltage source inverter is defined as the inverter which takes a variable frequency from a DC supply. The input voltage of the voltage source inverter remains constant, and their output voltage is independent of the load.

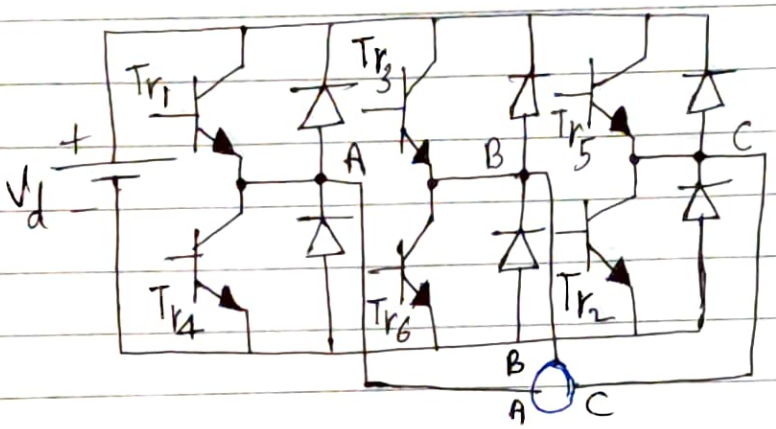
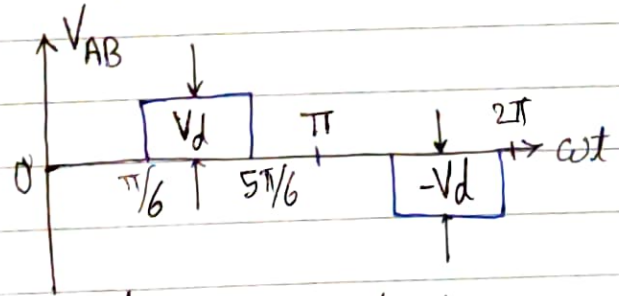


fig. Transistor Inverter-fed Induction Motor Drive

The voltage source inverter use self-commuted device like MOSFET, IGBT, GTO, etc. It is operated as a stepped-wave inverter or a pulse width modulation.

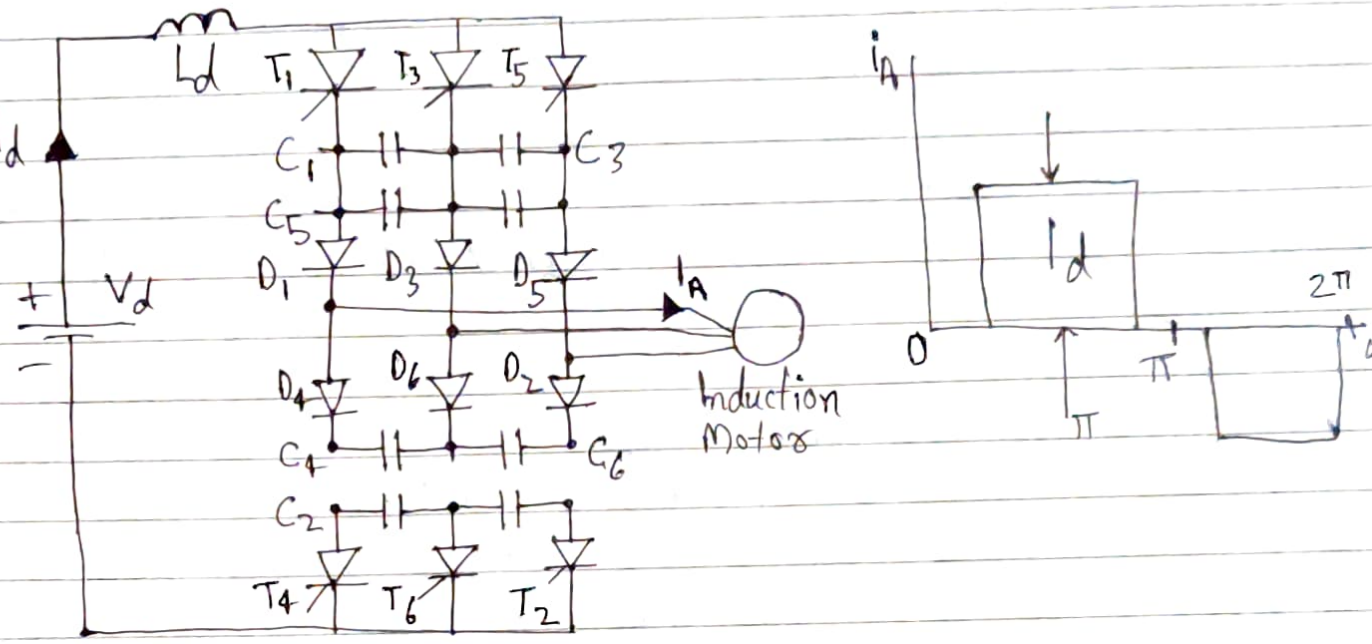


Stepped wave Inverter line voltage waveform

Voltage source inverters are most commonly used in industrial applications such as speed control of Induction motor. For controlling speed of the Induction motor it is

necessary to vary the voltage or frequency.

2. Construction of Current Source Inverter



The voltage source is connected in series with a large value of Inductance (L_d) and this named the circuit as the current source.

The circuit consists of six dioder ($D_1, D_2, \ldots D_6$), six capacitors ($C_1, C_2, \ldots C_6$), six thyristors ($T_1, T_2, \ldots T_6$) which are fixed with a phase difference of 60°. The inverter output is connected to the Induction motor. For a given speed, torque is controlled by varying the dc-link current I_d and this current can be varied by varying the V_d. The conduction of two switches in the same leg doesn't lead to a sudden rise of current due to the presence of a large value of Induction L_d.

Working of Current Source Inverter

The current source inverter converts the input direct

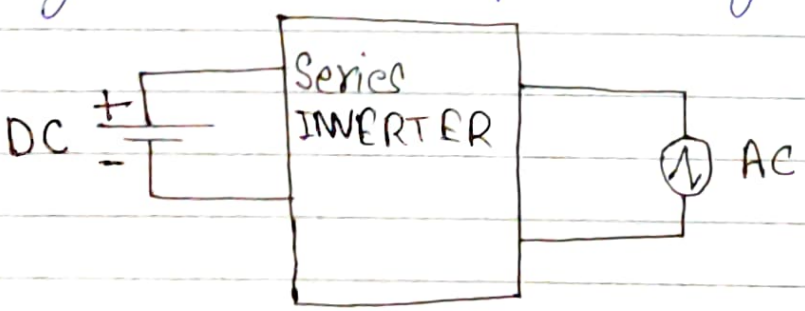
current into an alternating current. In current source inverter, the input current remains constant but this input current is adjustable. The output voltage of the inverter is independent of the load.
The diodes D_1 - D_6 and capacitor C_1 - C_6 provide commutation of Thyristor T_1 - T_6, which are fired with a phase difference of 60° in the sequence of their number. The torque is controlled by varying DC link current I_d by changing the value of V_d.

Application

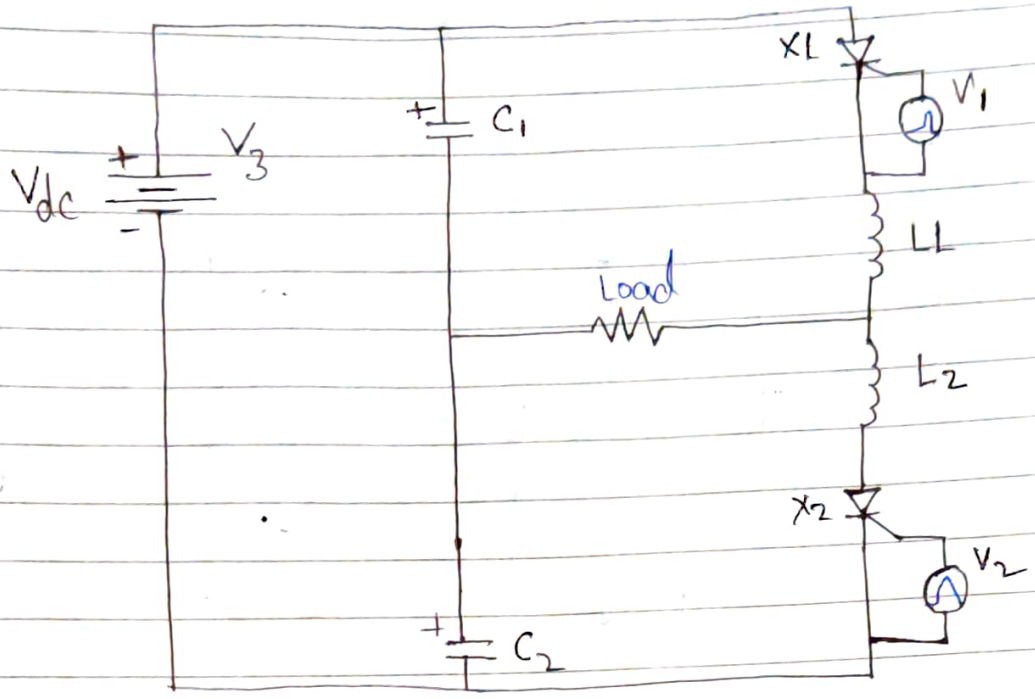
- UPS units
- LT Plasma generators
- AC motor drives
- Switching devices
- Induction motors for pumps and fans

3. Series Inverter

It is used to convert the direct-current to alternating current of required voltage.



In Series inverter, the commutating elements L and C are connected in series with the load. This constitutes a series RLC resonant circuit. The two SCRs are used to produce the halves (positive and negative half cycle) in the output.



Hence, 50% of the current is drawn from the input source and 50% from the capacitor and Again 50% of the load current is obtained from the DC input source and rest from the capacitor.

Applications

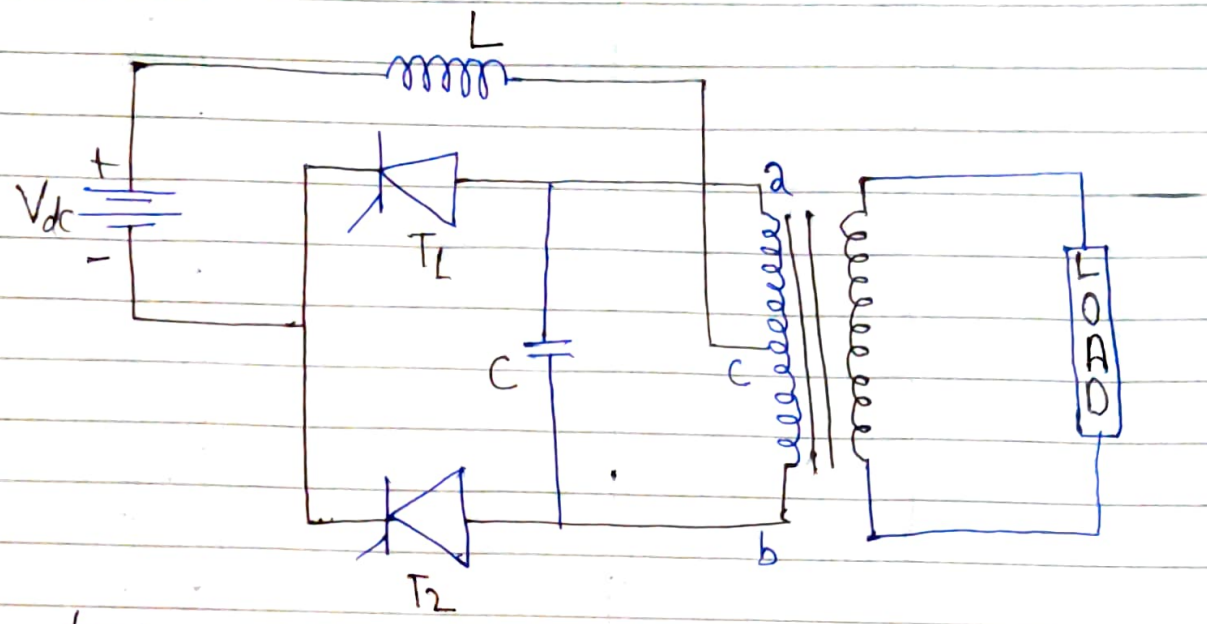
This type of Inverters generate sinusodial waveform whose output frequency is in the range of 200 Hz to 100 kHz therefore it is applicable for

- Ultrasonic generator
- Induction heating
- Sonar Transmitter and
- Fluorescent lightning

4. Parallel Inverter

The commutating capacitor C is connected across supply source therfore it is called as Parallel Inverter. The turn ratio of half primary winding and secondary winding is kept unity. The SCR T1 and SCR T2 are

main SCRs from which load current passes through it.



Advantages

- Simple forced commutation circuit
- Sinusodial waveform at output is possible by using suitable filter circuit

— when load is inductive, the load current becomes out of phase with load voltage and direction of load current reverses with respect to load voltage.

Stored energy of capacitor transfer to load via transformer lower side primary winding.