Quasi Cascaded H-Bridge Five-Level Boost Inverter

Introduction:

Multilevel inverters have recently received many attentions from researchers due to their advantages over the conventional three-level pulse-width modulation (PWM) inverters. The advantages of the multilevel inverters are as follows: improved quality output waveforms with lower total harmonic distortion (THD), smaller filter size and lower electromagnetic interface (EMI).

Three general multilevel inverter topologies are: flying capacitors, neutral point clamped (NPC), and cascaded H-bridge (CHB) inverters. Among these topologies, the CHB inverter has unique advantages in modularity and its contribution of high power. These advantages make the CHB inverter an attractive option for many applications such as uninterruptible power supplies.

Existing system:

The conventional two-stage CHB boost-five-level inverter (CHB-BFLI). Two capacitors, two boost inductors, two diodes, ten switches, one filter inductor and a resistive load are utilized in the conventional CHB-BFLI. The boost DC-DC converter is used to control the DC-link voltage on each H-bridge circuit.

Both the top and bottom switches in the same leg cannot be switched on simultaneously because the DC-link capacitor is connected to each leg in parallel. And a dead-time between two
switches in the leg must be used to avoid short circuit in the DC source.

**Dis-advantages:**
- More complex
- More no of component and less efficiency.

**Proposed system:**

Novel single-stage quasi-cascaded H-bridge five-level boost inverter (qchb-FLBI) is proposed. The proposed inverter consists of two separate DC sources, two quasi-boost inverter (qBI) modules and an inductor filter connected to the resistive load in series. Each qBI module contains one capacitor, one boost inductor, four switches and two diodes. A phase-shifted sinusoidal pulse-width modulation (PS-SPWM) strategy for the proposed QCHB-FLBI. For module 1, two control voltages, \( v_{control1} \) and \( v_{control2} \) are compared to a high-frequency triangle voltage, \( V_{tri1} \), to produce control signals for the \( S1 \) and \( S2 \) switches.

The proposed five-level inverter has the advantages over the cascaded H-bridge quasi-Z-source inverter (CHB-qZSI) in cutting down passive components. In the CHB-qZSI, the operating frequency of the inductors is twofold the switching frequency. Therefore, the high-frequency current ripple on inductors of the proposed qCHB-FLBI is a half that of the CHB-qZSI.

**Advantages:**
- Five-level output voltage with boost voltage ability,
- reduction in a number of passive components
- And shoot-through immunity.
Applications:
- High power conversion applications.

Block Diagram: