



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19EET301 / POWER ELECTRONICS AND DRIVES

V SEM EEE

UNIT 3 –AC CONVERTERS

PWM TECHNIQUES

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PULSE WIDTH MODULATION (PWM) TECHNIQUES

Use –

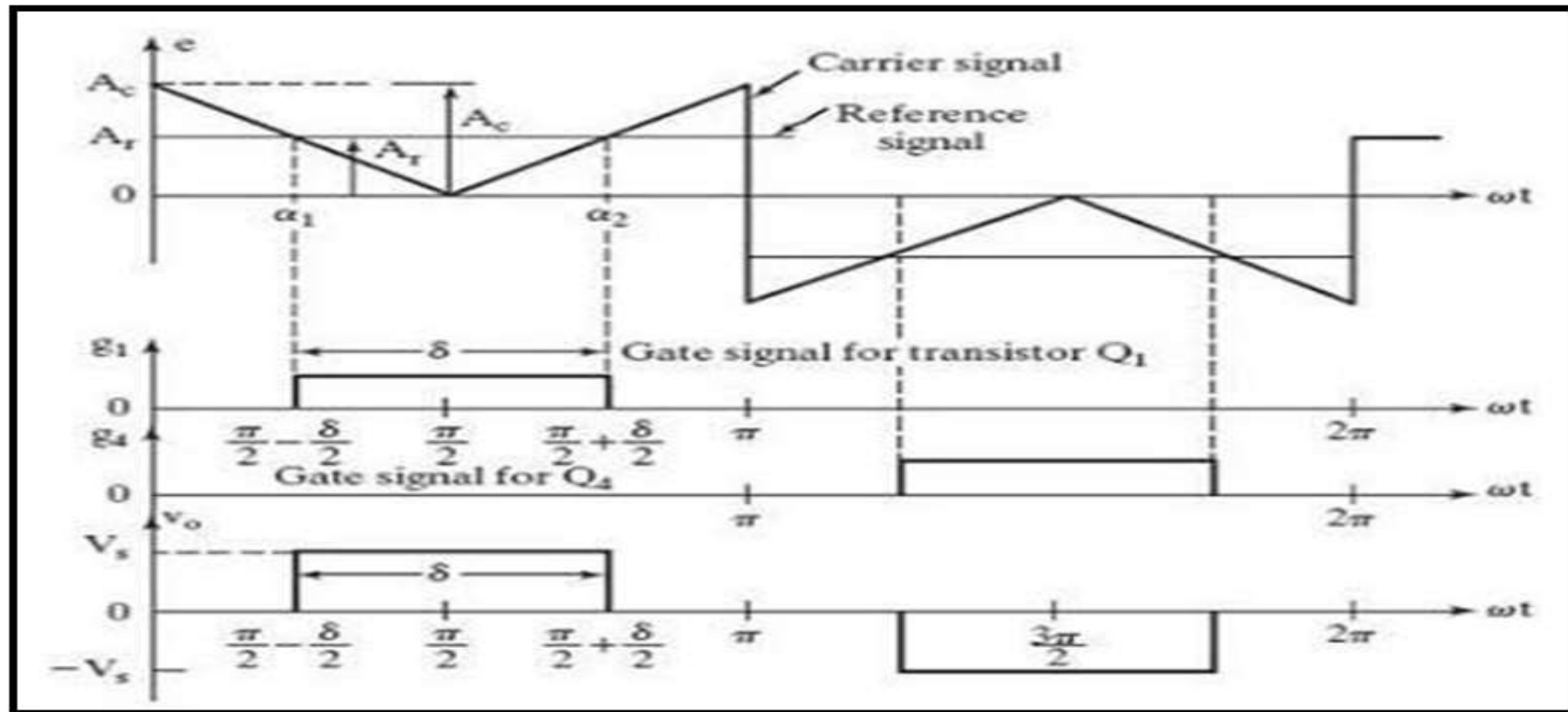
PWM Techniques are used to obtain inverter output voltage control and to reduce its harmonic content.

Techniques –

1. Single – Pulse Modulation
2. Multiple – Pulse Modulation
3. Sinusoidal – Pulse Modulation



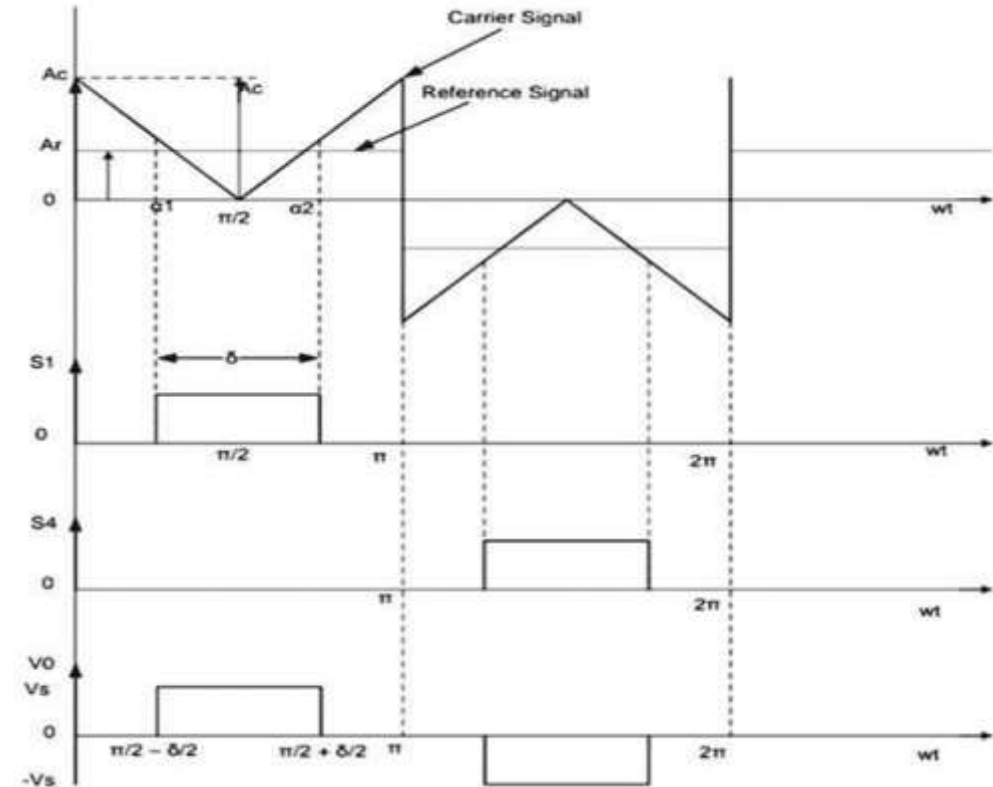
1. SINGLE – PULSE MODULATION





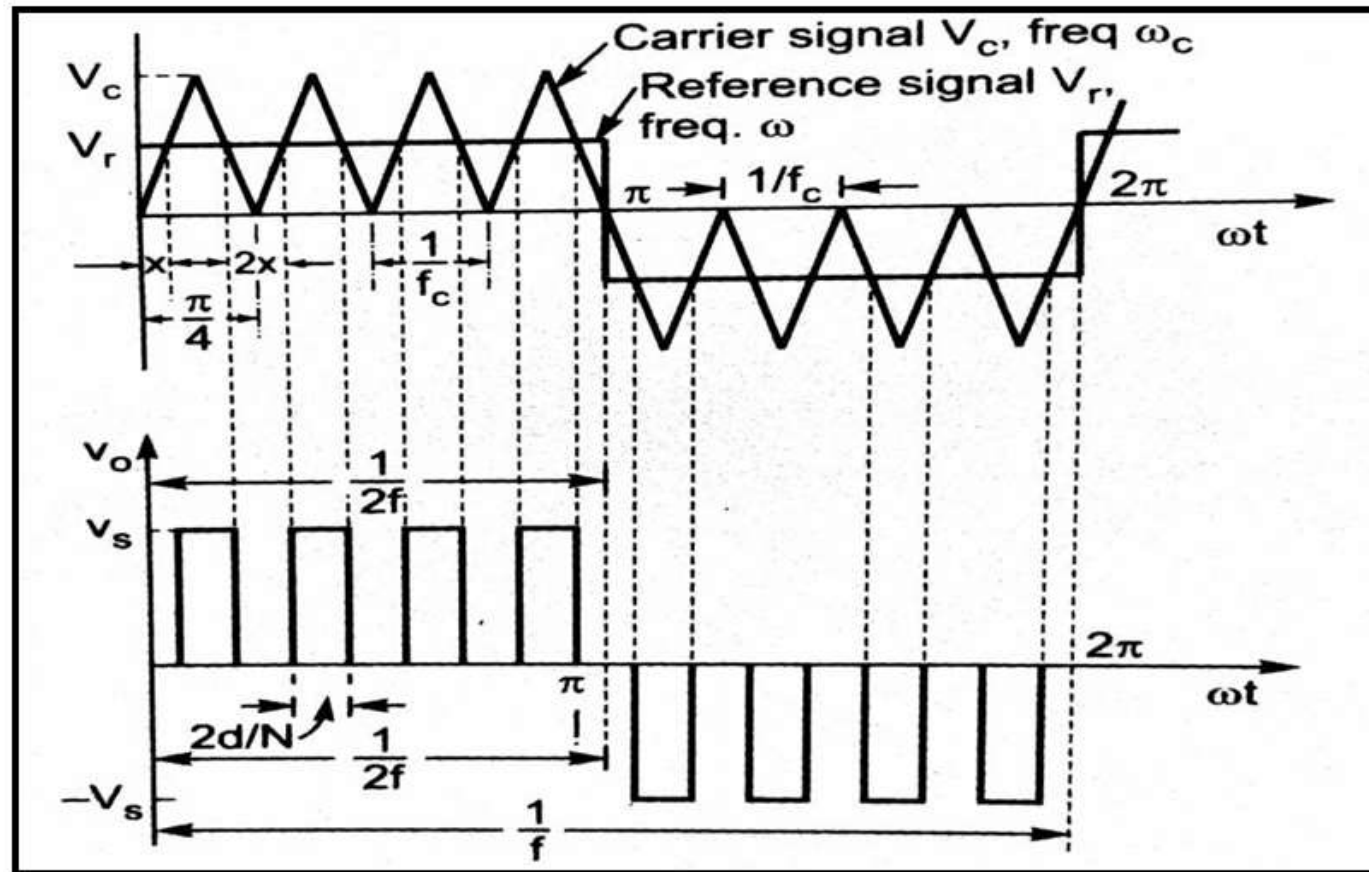
Single Pulse Width Modulation

- The reference signal is square wave signal and the carrier signal is triangular wave signal.
- The gate pulse for the switches is generated by comparing the reference signal and carrier signal.
- The frequency of output voltage is controlled by the frequency of the reference signal.
- The modulation index can be defined as A_r/A_c .
- The main drawback of this technique is high harmonic content.



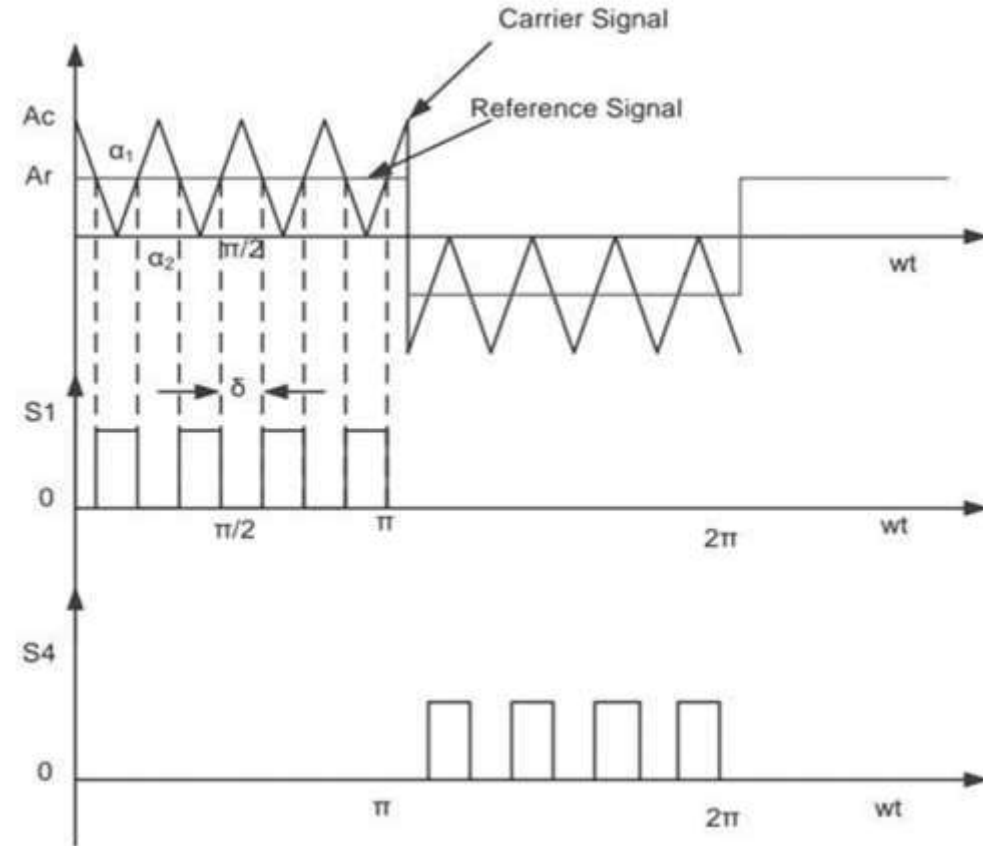


2. MULTIPLE – PULSE MODULATION



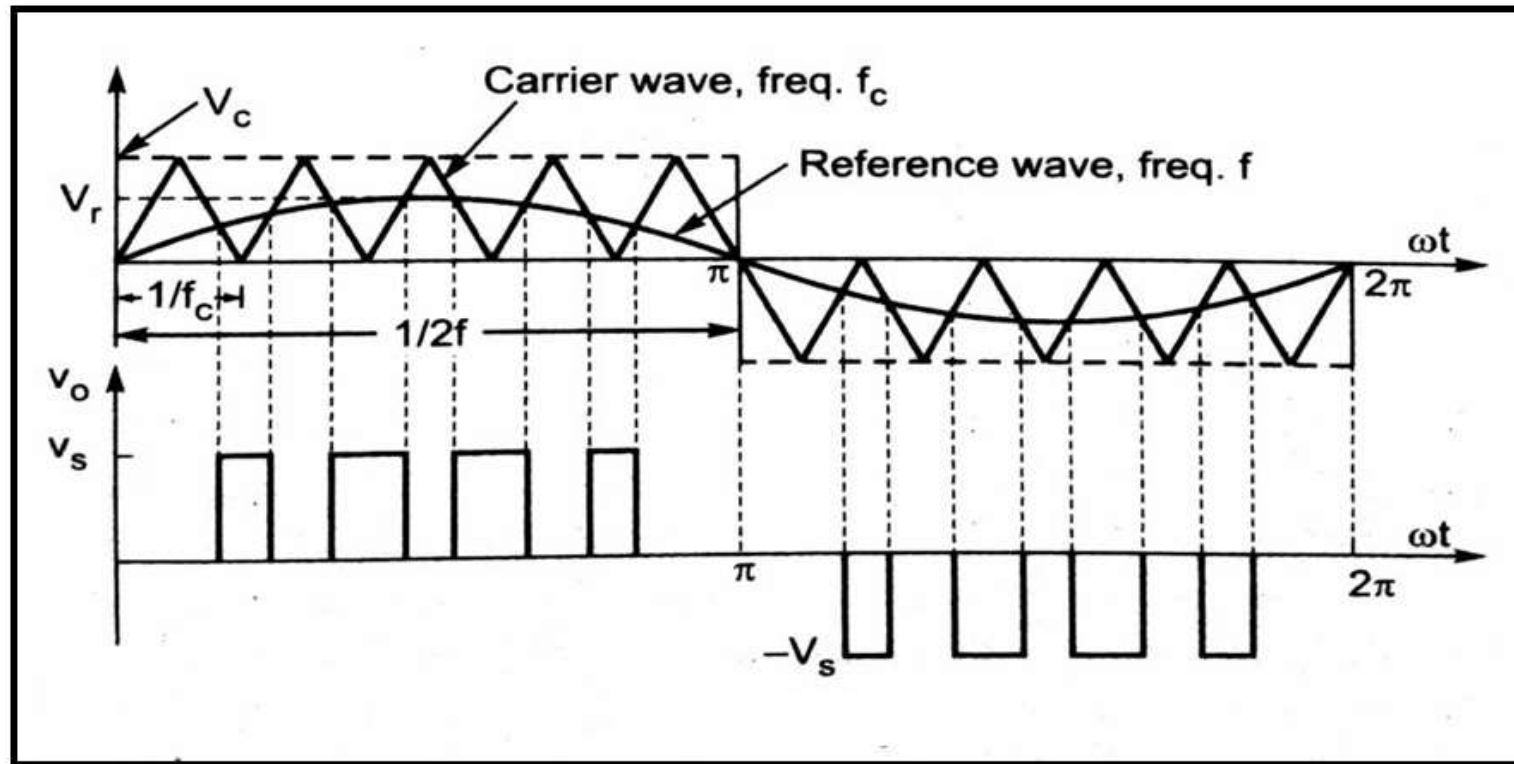


- ❑ **Multiple Pulse Width Modulation (MPWM)**
- ❑ Number of pulses are used in each half cycle of the output voltage.
- ❑ The output frequency is controlled by controlling the frequency of the carrier signal.





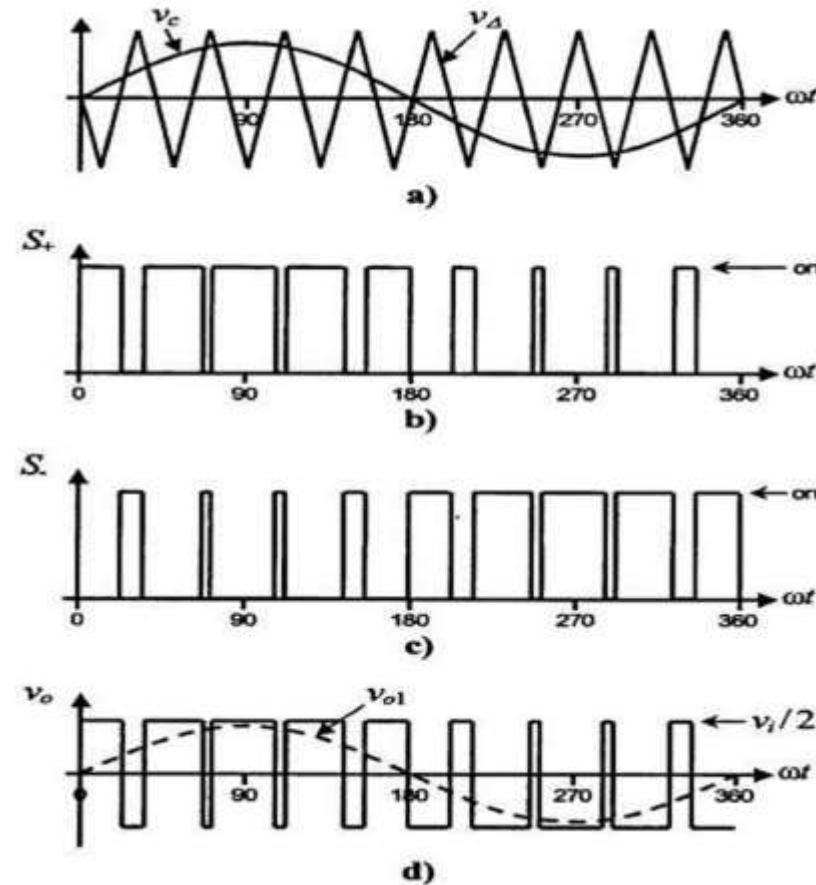
3. SINUSOIDAL – PULSE MODULATION





□ Sinusoidal Pulse Width Modulation (SPWM)

- This control technique is widely used in applications.
- The reference signal is a sine wave signal.
- The gate pulse for the switches is generated by comparing the sine wave reference signal with the triangular carrier wave.
- The width of each pulse varies with variation of amplitude of the sine wave.
- The frequency of output waveform is the same as the frequency of the reference signal.





HARMONICS

- Harmonics are any frequency that exists in the system except the fundamental frequency.
- Non linear loads are source of harmonics.
- The presence of harmonics in electrical systems means that current and voltage are distorted and deviate from sinusoidal waveforms.
- Harmonics increases the losses in the system and reduces the efficiency.
- Harmonics can be eliminated by using filters and by linearizing the load.
- Harmonics present is measured in terms of T.H.D (Total Harmonic Distortion)

