Sheet (6)

(1) From the review of the cycloconverter:
  [a] What are the basic concept, construction and applications of the cycloconverter?
  [b] Why the maximum output frequency is limited to ⅓ of the input frequency?
  [c] What are the basic forms of the cycloconverter?

(2) Draw and explain; how can you use 1-ph cycloconverter to get an output voltage has a frequency of 16⅔Hz from a voltage source has a frequency of 50Hz?

(3) Draw and explain; how can you use 1-ph cycloconverter to get an output voltage has a frequency of 10Hz from a voltage source has a frequency of 50Hz?

(4) Make a comparison between VSI and matrix converter.

(5) Draw the power circuit of the matrix converter, then:
  [a] Write the mathematical expression of switching function,
  [b] Determine the 27 switching state combinations.

(6) Draw the possible discrete configurations of a bi-directional switch used in matrix converter. Write the merit and demerit of each of them.

(7) Draw a diagram of the four-step commutation strategy used to commutate the switches of matrix converter when the current flows from the supply to the load.

(8) Repeat problem (7), when the current flows from the load to the supply.

(9) A 380V, 50Hz, nine-switch matrix converter feeding an inductive load. The output frequency is 100Hz. Determine:
  [a] The minimum value of the switching frequency,
  [b] The possible maximum output voltage.

(10) A 3-phase inductive load is fed from a 3-ph, 380V and 50Hz supply via a matrix converter. The fundamental output phase voltage can be expressed as:

$$V_o = 120\cos(628t) \quad \text{V}$$

Determine:
  [a] The output and the switching frequencies,
  [b] The modulation index.