Home work 2

Problem 2:1

Design a three-phase wye-connected (Y) winding for a four-pole (p = 2) squirrel-cage motor when the number of slots per phase and pole is q = 6, and the winding is a one-layer concentric winding.

a) Draw the base winding of the one-layer concentric winding.
   Instruction: base winding = the smallest number of slots by which the whole winding can be characterised.
b) Draw the total magnetomotive force produced by all the sinusoidal phase currents at a time instant when one of the phase currents has its peak value.
   Assumption: number of turns in a coil is N = 1, the peak value of the current is $\hat{i}_1$ =1.

$$\begin{cases} i_{\mathrm{mA},1}(t) = \hat{i}_1 \cos(\omega t) \\ i_{\mathrm{mB},1}(t) = \hat{i}_1 \cos\left(\omega t - \frac{2\pi}{3}\right) \\ i_{\mathrm{mC},1}(t) = \hat{i}_1 \cos\left(\omega t - \frac{4\pi}{3}\right) \end{cases}$$

c) Define the winding factors of the harmonic waves ν = 1, 3 and 5 by drawings and verify the drawings using the equation for winding factor given at Lecture 5.

Problem 2:2

Design a three-phase wye-connected (Y) winding for a four-pole (p = 2) squirrel-cage motor when the number of slots per phase per pole is q = 4, the coil pitch is W = 10, and the winding is a two-layer diamond winding.

a) Draw the base winding of the two-layer diamond winding.
   Instruction: base winding = the smallest number of the slots by which the whole winding can be characterised.
b) Draw the total magnetomotive force produced by all the sinusoidal phase currents at a time instant when one of the phase current has its peak value.
   Assumption: number of turns in a coil is N = 1, the peak value of the current is $\hat{i}_1$ =1.
c) Define the winding factors of the harmonic waves ν = 1, 3 and 5 by drawings.