MIDDLE EAST TECHNICAL UNIVERSITY

ELECTRICAL & ELECTRONICS ENGINEERING

EE462 - UTILIZATION OF ELECTRICAL ENERGY

HOMEWORK V

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1 Part A - Pre Design Stage

1.1 Q1

In this part, we are asked to calculate the rated torque of the motor.

$$T_{rated} = \frac{P_{nominal}}{\omega_{nominal}} = \frac{400kW}{50\pi} = 2546\ Nm \tag{1}$$

1.2 Q2

In this part, we are going to calculate the rated frequency of the machine, and depending on the maximum frequency, we will choose a switching frequency.

$$f_{m,max} = \frac{2250}{60} = 37.5Hz, \tag{2}$$

$$f_{max} = f_{m,max}pp = 75Hz \tag{3}$$

As we increase the switching frequency, the losses will increase. So, we need to choose an adequate switching frequency. Also, to eliminate the lower harmonics we are going to choose a large switching frequency.

We choose the switching frequency as

$$f_s = 3000 \tag{4}$$

1.3 Q3

2 Part B: Sinusoidal PWM

2.1 Q1

2.2 Q2

2.3 Q3

2.4 Q4

3 Part C - Space Vector PWM

3.1 Q1

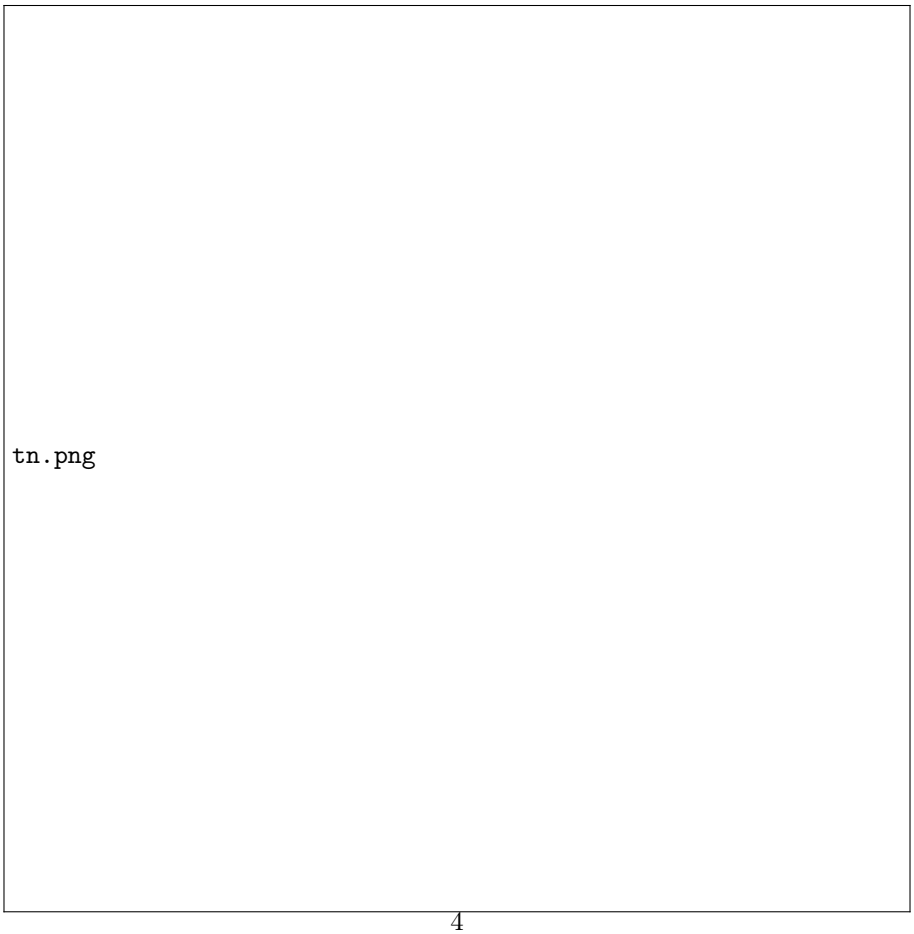

Figure 1: Ideal torque vs speed

3.2 Q2

3.3 Q3

3.4 Q4