**EE 464**

**STATIC POWER CONVERSION-I**

**Spring 2022-2023**

**Homework 2**

**Complete Simulation Report**

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Metehan Küçükler –

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# Introduction

This report explains the design decisions for the hardware project. Furthermore, it presents the details of the Magnetic Design of the Isolated Power Supply and the simulation results for the selected topology.

# Magnetic Design

1. The duty range of the converter is selected as [0.278 – 0.336] to match the design by the Ti Webench. According to the duty range determination, the turns raio is calculated via the MATLAB code below.

clearvars

syms d turnsRatio

v\_o = 48

d\_min = 0.278; v\_d\_minduty = 18;

d\_max = 0.366; v\_d\_maxduty = 12

turnsRatio\_minduty = ( (d\_min/(1-d\_min)) \* (v\_d\_minduty/v\_o) )^-1

turnsRatio\_maxduty = ( (d\_max/(1-d\_max)) \* (v\_d\_maxduty/v\_o) )^-1

According to the code above, the transformer turns ratio (Ns/Np) is calculated as 6.93.

2. The available cores and coil formers are investigated. Firstly, due to its available stock number is high, PCB5530-FA is selected as the coil former. Therefore, the compatible core 0P45530EC is celected as the transformer core. However, after calculations, it is seen that this core is overkill. Afterward, 79440A7 toroidal core is selected due to its high stock number and wide window area. Wide window area makes the wounding procedure more easy.
3. Using the MATLAB code below, the primary turn number is 13, while the secondary turns number is 87. The magnetizing inductance is 8 uH.

U\_o = v\_o;

v\_t = d\_max;

f\_sw = 100e3;

i\_out = 1;

i\_avgSec = i\_out/(1-v\_t);

xformerCurrRipple = 0.5; % percent

L\_sec = (U\_o\*(1-v\_t))/(xformerCurrRipple\*i\_avgSec\*f\_sw)

L\_pri = L\_sec/(turnsRatio\_maxduty^2)

% (turnsRatio\_maxduty^2)\*2.814e-6

syms priTurns secTurns

AL = 51e-9 % nH/T^2; minimal

priTurns = double(solve(L\_pri == AL\*priTurns^2))

secTurns = double(solve(L\_sec == AL\*secTurns^2))

% make sure core is not saturated

ampTurns = i\_out\*secTurns

# Complete Simulations

# Conclusion