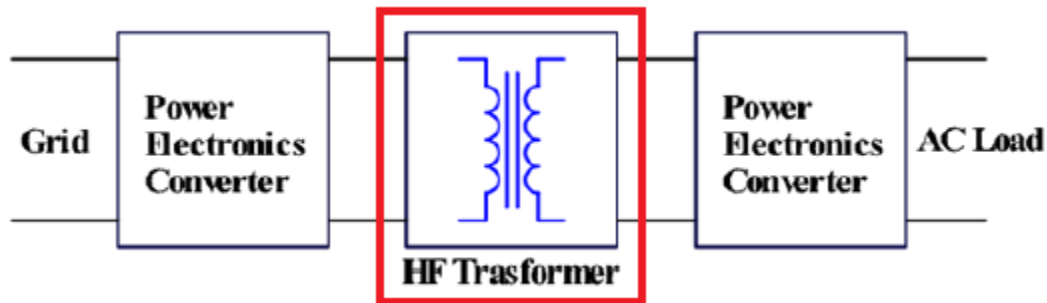


KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT

EE 306

Semester 192 – Term Project
High-frequency Single Phase Transformer



❖ **Overview:**

High-frequency transformer (HFT) operates using the same principles as standard transformers. The main difference is that, as its name implies, it operates at higher frequencies, whereas most power transformers operate at 50/60 Hz, HFT uses frequency ranges from 20 kHz to over 1MHz. HFT uses a ferrite core due to high magnetic permeability. This type of transformers offers very low losses and its size is significantly smaller than the conventional one. Due to this, ferrite core transformers are used in high-frequency applications such as in Switch Mode Power Supply (SMPS).

❖ **Objectives:**

The objective of this project is to design a (XX/Y) kVA, 220/6600 volts, high frequency (100 kHz) single-phase transformer by doing the necessary calculations using the equations in:

- a) http://schmidt-walter-schaltnetzteile.de/smps_e/trafo_hilfe_e.html#cal-wd
- b) <http://www.diva-portal.org/smash/get/diva2:1328379/FULLTEXT01.pdf>
- c) https://ecee.colorado.edu/~ecen5797/course_material/Lecture41.pdf

to provide the following:

1. The number of turns in primary and secondary.
2. The primary and secondary currents in Amperes.
3. The detailed information about AWG Copper Magnet Wire to be wound and placed in the former for the primary and secondary windings, information about AWG, length in mm, diameter in mm, the area in mm², resistance... etc. for both the primary and secondary.
4. The former size needed to carry the required primary and secondary coils. (check: <https://www.formers.co.uk/>).
5. The recommended ferrite core shape and dimensions. You may use any standard configuration such as E, EC, ETD, PQ, U, UI, UU, POT, EP, TROID, etc. Please refer to a data sheet provided by any manufacturer like MAGNETICS or TDK.
6. Draw the transformer and indicate the dimensions of the core and formers. (Please try to use Visio or any other preferred drawing software).
7. Estimate the cost of your designed transformer.

Note that

"XX" is your two-digits serial number, e.g., 01, 02, 10, 12, 20, ..etc.

"Y" is your section number, e.g., 1, 2, 3, 4 or 5.

❖ **Report Evaluation- (100 Points):**

- 1. Report organization clarity and professionalism** – Was the report well written and organized? Was it easy to understand and follow? Did the author appear to take the assignment seriously and work hard to produce a professional product? Did the report include all the required elements? (25 Points)
- 2. Design effectiveness** – Is the design effective and accurate? Does it meet the technical specifications of the project? (25 Points)
- 3. Design synthesis** – Does the report describe well the synthesis of the design? Are the design equations and calculations clearly, completely, and unambiguously stated? (25 Points)
- 4. Design analysis** – Is the analysis of the design complete and unambiguous? Is the analysis correct? Were all questions satisfactorily answered? Did the author's appear to know why their observations and calculation were correct? Did the authors show sufficient insight in the cost calculation? (25 Points)

Each student has his own design case, and should submit formal report explaining all the necessary steps, drawings, and calculations needed.

Due Date: UT-Classes, April 19, 2020; MW-Classes, April 20, 2020