Topic	Description
Module	Antriebtechnik (Electric Drives)
Module Code	ANT
Semester	5
Lecturer	Daniel T. McGuiness, Ph.D
ECTS	5
SWS Total	3
SWS Lab	1
SWS Teaching	2
Lecture Type	ILV
Teaching UE	30
Coursework Name	Electric Drives Assignment WS 2024
Work	Individual
Suggested private Study	10 hours including Report Writing
Submission Format	Online via SAKAI
Submission Deadline	23:59, 12th November, 2024
Late Submission	Not accepted
Resubmitting Opportunity	No re-submission opportunity
Feedback	via Comments on SAKAI
Learning Outcomes	- Understanding of magnetic circuits
	- Understanding of single phase transformers
	- Understanding of three phase induction drives
	- Understanding of DC motor operation principles

Table 1: Information About the Assignment.

> No lecture time is exclusively devoted to the aforementioned Assignment.

A portion of the mark for every assignment will be, where applicable, based on style. Style, in this context, refers to organisation, flow, sentence and paragraph structure, typographical accuracy, grammar, spelling, clarity of expression and use of correct IEEE style for citations and references. Students will find *The Elements of Style (3rd ed.)* (1979) by Strunk & White, published by Macmillan, useful with an alternative recommendation being *Economist Style Guide (12th ed.)* by Ann Wroe.

The table below presents the point distribution based on the questions and the overall report structure.

Assessment	Details of Concern	%
Report Style	(formatting, TOC, title page, captions, ...)	10
Question 1	Concerning Magnetic Materials & Circuits	20
Question 3	Concerning Single Phase Transformers	20
Question 4	Concerning DC Motors & Armature Reaction	20
Question 5	Concerning 3∅ Induction Drives	20
Nomenclature	Correct use of Units and symbols	10
Sum		100

Table 2: Assessment Grade breakdown for the lecture.

1. A coil of insulated wire of 500 turns and of resistance 4 Ω is closely wound on iron ring. The ring has a mean diameter of 0.25 m and a uniform cross-sectional area of 700 mm^2.
   The diagram for it is shown below.

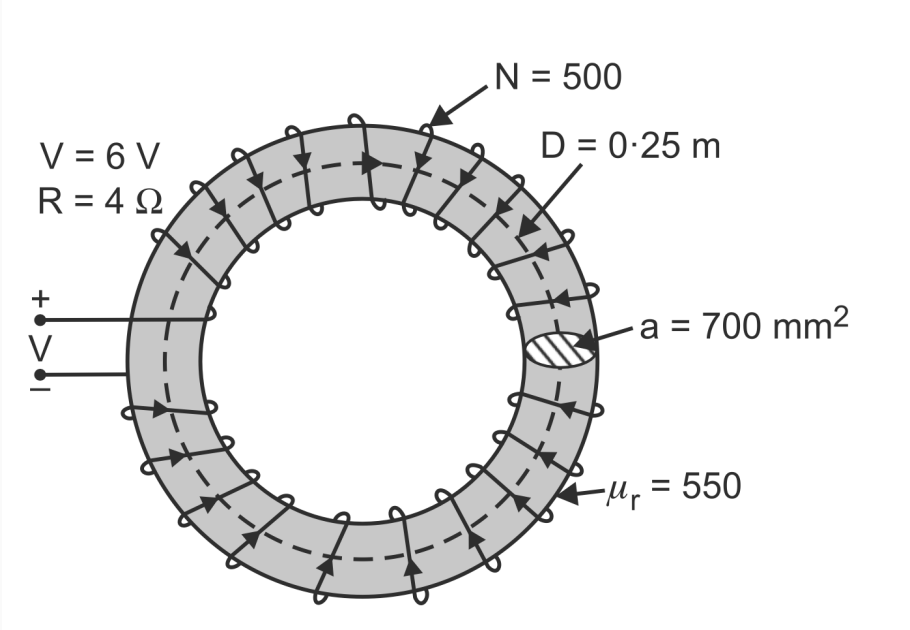

Figure 1: The magnetic circuit for question 1.

(20) Calculate the total flux in the ring when a DC supply of 6V is applied to the ends of the winding. Assume a relative permeability of 550.

2. A 230V, 50 Hz transformer has 200 primary turns. It draws 5 A at 0.25 p.f lagging at no-load. Determine:

(5) i. The Core loss,

(5) ii. Magnetising current

(10) iii. Core loss resistance and magnetising resistance.

Neglect magnetic leakage, resistance of the winding and the primary no-load current in relation to the full load current.

3. Please answer the questions briefly (max 200 words per question).

(8) What is armature reaction in a DC drive,

(6) what are the twi unwanted effects of it,

(6) Explain the disadvantages of armature reactions.

4. A three-phase wye (Y)-connected 220-V, 7.5 kW 60 Hz six-pole induction drive has the following parameter values in $\Omega/\varnothing$ referred to the stator:

$$R_1 = 0.294 \quad \Omega, \quad R_2 = 0.294 \quad \Omega,$$

$$X_1 = 0.503 \quad \Omega, \quad X_2 = 0.209 \quad \Omega, \quad X_m = 13.25 \quad \Omega.$$

The total friction, windage, and core losses are assumed to be constant at 403 W, independent of the load. For a slip of 2 percent, calculate:

(4) i. the speed,

(4) ii. output torque and power,

(4) iii. stator current,

(4) iv. power factor, and

(4) v. efficiency

when the motor is operated at rated voltage and frequency.

What is Required of You

- In this assignment you are presented with four (4) questions.
- The questions cover the topics of:
  - Magnetic circuits,
  - Transformers,
  - Induction Drives.
- You are required to solve these questions in an explicit manner.
- This entails you to write step by step derivation from what is given to what is required.

> No points will be given to answers where there is no clear path of derivation, even if the answer is correct. It is not possible for me to assess a work in which I am not able to see.

- In your report, please include the following:
  - A title page which includes:
    - Title
    - Name
    - Student Number
- Make sure you solve the equation in order they were presented to you.
  - If you were to skip a question, please leave it empty.
- Make sure your symbols used in the solutions are the ones that are used in the lectures.
- Citations (if required) must be done in IEEE format.
- Use LaTeX for your report.
- All questions must begin in a new page.
- Explain your derivations with one or two sentences (where possible).