EE341 - Course Notes

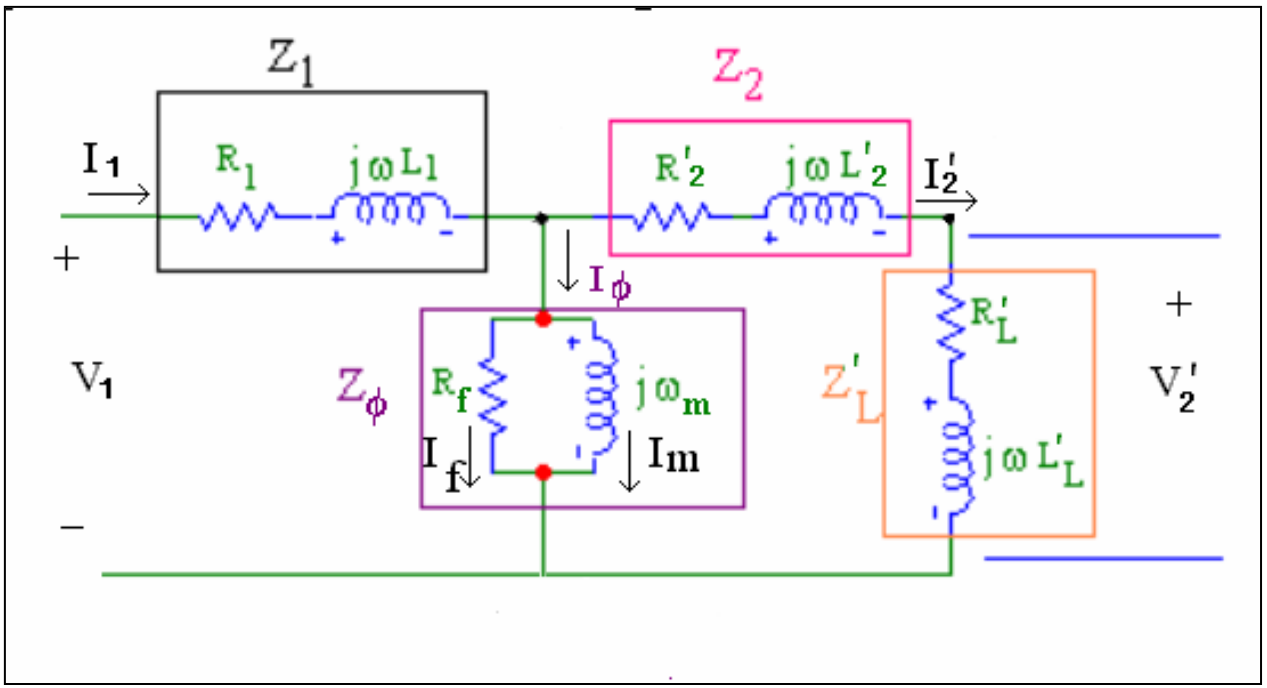
Electric Circuit Analysis

Homework No. 1

Instructor: Ali Keyhani

Homework No.1

1. **The operation of AC machines (in particular, transformers and induction machines) can be studied with the aid of the T-Circuit shown below.**



Primary or Stator **Secondary or Rotor**

Homework No.1

Several parameter sets are given in the table below. Your solutions should be summarized in a table in format as shown below. Use polar form for all complex number. Show your calculations separately.

Set	V_1	V_2	I_1	I'_2	I_f
Example 1	2700∠22°	-	10∠-39°	10∠-39°	0
Example 2	-	23∠-54.6°	259.4∠-54.6°	259.4∠-54.6°	23∠-55°

(Example solution)

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Practice all cases.

Only cases with parametes sets 1, 2, 4, and 11 will be graded.

Write a Matlab program to solve case 11.

SET	Z_1		Z_ϕ Parallel		Z'_2		Z_L		V1	V2	I_1	I'_2	I_f
	R_1	L_1	R_f	L_m	R'_2	L'_2	R_L	L_L					
1	1	0.01	10000	8	1	0.01	Open Circuit		480∠ 0°	?	?	?	?
2	1	0.01	10000	8	1	0.01	200	0	480∠ 0°	?	?	?	?
3	0.02	0.00265	Open Circuit		0	0	Open Circuit		1∠0°	?	?	?	?
4	0.02	0.00265	Open Circuit		0	0	1.0	0	1∠0°	?	?	?	?
5	0.02	0.00265	Open Circuit		0	0	.707	$1.875x10^{-3}$	?	1∠0°	?	?	?
6	0	0	100	0.1	0.01	$106x10^{-6}$	1.0	0	1∠0°	?	?	?	?

Homework No.1

SET	Z_1		Z_ϕ Parallel		Z'_2		Z_L		V1	V2	I_1	I'_2	I_f
	R_1	L_1	R_f	L_m	R'_2	L'_2	R_L	L_L					
7	0	0	100	0.01	.01	106 $x10^{-6}$	1.414	3.75x10^{-3}	1∠0°	?	?	?	?
8	.3	1.33x 10^{-3}	Open Circuit	3.45 $x10^{-2}$	.15	.56 $x10^{-3}$	7.35	0	127 ∠0°	?	?	?	?
9	10	5.2 $x10^{-2}$	Open Circuit		0	0	200	.4	?	5000 ∠0°	?	?	?
10	.15	2.54x 10^{-3}	Open Circuit		1.57	6.24x 10^{-3}	98.5	.178	2400 ∠0°	?	?	?	?
11	.3	0.003	1	4.25 $x10^{-2}$	.2	.003	10	0	440 ∠0°	?	?	?	?
12	.3	0.003	0	4.25x10^{-2}	.2	.003	1.0	0	380 ∠0°	?	?	?	?

Homework No.1

Assume

1. **All elements are in series except R_f and L_m which are in parallel.**
2. **R = ohms; L=henrys; V = volts; ωL=ohms.**
3. **$\omega=2\pi f=377$ radsec; jX= j ωL for f=60Hz**
4. **Open circuit = R and/or L to infinity**
5. **Short circuit = R and/or L to $\rightarrow 0$**

Homework No.1

2. **For the cases with parameters sets 1, 2, 4 and 11 in the table, draw the Thevenin equivalent circuits seen by the load Impedance Z_L', connected to terminals A-B. Calculate the parameters of the Thevenin equivalents circuits.**

3. **For cases with parameter sets 1, 2, 4 and 11 in the table, and assuming L_L'=0. Find the values of R_L' wich will result in the maximum power delivered to R_L'. (use the maximum power transfer principle).**

4. **As the power specialist in your company, you are asked to derive a model of an AC machine. With the machine terminals open-circuited, you are measure Voc=100V. With the machine terminals shorted, you measure Isc=50A. Calculate the parameters of the Thevenin Equivalent circuit of the machine.**