TATU BOGDAN
CTI ENG 2020

LAB 3

Grupa 3.1
G = 3 N = 10
=> U = 32V

$\omega = 2\pi f$, $X_C = \frac{1}{\omega C}$; $X = -X_C$, $Z = \sqrt{R^2 + X^2}$; $I = \frac{U}{Z}$; $U_C = X_C \cdot I$; $U_R = R \cdot I$

V_{pp}[V]	f[Hz]	R[Ω]	C[μF]	X_C[Ω]	Z[Ω]	U[V]	I[mA]	U_C[V]	U_R[V]
20	1000	220	0.1	1592.55	1607.67	32	19.90	31.67	4 38
20	1000	220	0.5	318 31	386.94	32	82.70	26.32	18.19
20	1000	220	1	159.15	271 53	32	117 85	18.76	25.93
20	1000	220	1.5	106.10	244.25	32	131 01	13.90	28.82
20	1000	220	2 2	72 34	231. 59	32	138.18	10.00	30.40
20	1000	220	47	33.86	222.59	32	143.76	4. 87	31.63

Same as table I

V_{pp}[V]	f[Hz]	R[Ω]	C[μF]	X_C[Ω]	Z[Ω]	U[V]	I[mA]	U_C[V]	U_R[V]
20	50	220	1	3183.1	3190.69	32	10 03	31 92	2 21
20	100	220	1	1591.55	1606.68	32	19 92	317	4.38
20	250	220	1	636.62	673.56	32	47.51	30.24	10.45
20	500	220	1	318.31	386.94	32	82.70	26.32	18.19
20	1000	220	1	159.15	271.53	32	117 85	18.76	25.93
20	2000	220	1	79.58	233.95	32	136.78	10 88	30.09

$\omega = 2\pi f$; $X_L = \omega L$; $Z = \frac{U}{I}$; $Z^2 = R^2 + X_L^2$ => $X_L = \sqrt{Z^2 - R^2}$ => $L = \frac{X_L}{\omega}$

N[turns]	R_L[Ω]	Iron Core	f[Hz]	U[V]	I[mA]	Z[Ω]	L[mH]
250	0.75	Yes	1000	0.995	122	8.16	1.29
250	0 75	No	1000	3.81	102	37.35	5.94
500	3.9	Y	1000	3.30	104	31.73	5.01
500	3.9	N	1000	6.51	41 5	156.87	24.96
1000	21.1	Y	1000	5.90	51.6	114.34	17.89
1000	21.1	N	1000	6.95	11.0	631.82	100.50

I. 1. a) Increasing the capacitance increases the current, as a result of the growth in capacitance lowering the capacitive reactance, thus lowering the impedance of the circuit.

1 b) line 5: $U < U_C + U_R \Leftrightarrow 32 < 10.00 + 30.4$
$\Leftrightarrow 32 < 40.4$

II 2. b) Increasing the frequency increases the current, because of the same effect on reactance and impedance as 1 a)

c) line 3: $U < U_C + U_R \Leftrightarrow 32 < 30.24 + 10.45$
$\Leftrightarrow 32 < 40.69$

III 3. a) Adding an iron core to the inductor increases it's inductance

b) $\frac{L_{1000}}{L_{500}} = \frac{17.89}{5.01} = 3.57$; $\frac{L_{1000}}{L_{250}} = \frac{17.89}{1.29} = 13.87$; $\frac{L_{500}}{L_{250}} = \frac{5.01}{1.29} = 3.88$

The inductance ratio is related to the square of the ratio of turns of each inductor times some constant error

c) $f = 500\ Hz \Rightarrow \frac{L_W}{L_{WO}} = \frac{24.96}{5.01} = 4.98$

II 2. a)

2V = 1 cm
f = 500 Hz