Problem 1	Given:
	A resistor of 6.8 Ω and an inductor of 16 mH are connected in series to a voltage source of
10 points	230 V_{rms} and 50 Hz.
	Calculate:
	The apparent power
	The real power
	The capacitance required in parallel with the load in order to bring the power factor to 1.
Problem 2a	Transformer:
	winding N_1 , winding N_2 ; $N1/N_2 = 3$
7 points	Neglecting the winding resistances, leakage inductances and core loss.
	For winding 1:
	$V = 230 V_{rms}$, f = 50 Hz, the magnetizing current is 1.0 A _{rms} .
	For winding 2 :
	The load consist of a resistor of 1.9 Ω and an inductor of 1.1 Ω in series.
	Calculate:
	a) the amplitude and phase of \bar{I}_2 in winding N ₂
	b) the amplitude and phase of \bar{I}_1 in winding N ₁
Problem 2b	
	With an extra winding (N ₂):

Problem 2b	
3 points	With an extra winding (N ₃): The load exist of a resistor of 2.2 Ω , N ₁ /N ₃ = 3
	Calculate: c) the amplitude and phase of \bar{I}_1

Problem 3a	Consider a permanent-magnet dc-motor with the following parameters:
	$R_a = 0.35 \ \Omega, \ L_a = 1.5 \ \mathrm{mH},$
3 points	$k_T = 0.5 \text{ Nm/A}, k_E = 0.5, \text{ V/(rad/s)},$
	$J_m = 0.02 \text{ kgm}^2$
	The rated torque of this motor is 4 Nm.
	1) Plot the steady state torque-speed characteristics for $V_a = 120$ V en $V_a = 70$ V.
Problem 3b	2) The same motor is driving a load at a speed of 1,500 rpm. The load is purely inertial with an inertia of 0,04 kg.m ² .
7 points	Calaplata
	Calculate: The energy that will be recovered while slowing down to 750 rom
	The energy that will be recovered while slowing down to 750 rpm. The current during regenerative braking is max. $10 A$.

The questions:

Question 1	Draw a 'converter pole' with transistors and diodes.
	In how many quadrants and with one does it work.
2 points	
Question 2	For a single phase full bridge rectifier:
	Describe the process of commutation for the current between the thyristors.
3 points	How effect the inductor L_s value and the current value the commutation process?
Question 3	Describe the operation of a single-phase-power-factor corrected circuit.
	What is the relation between the supply voltage and dc-bus voltage?
2 points	Plot the current in the inductor (i_L) during the switching.
Question 4	How to avoid inrush current of a rectifier?
1 points	
Question 5	How can you change the direction of the rotation for an AC machine?
-	How can you calculate the speed of the rotor of an AC asynchronous machine? (as function of the
2 points	slip)