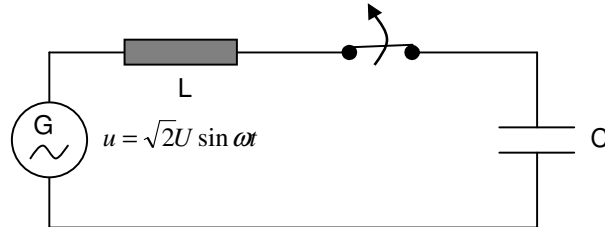
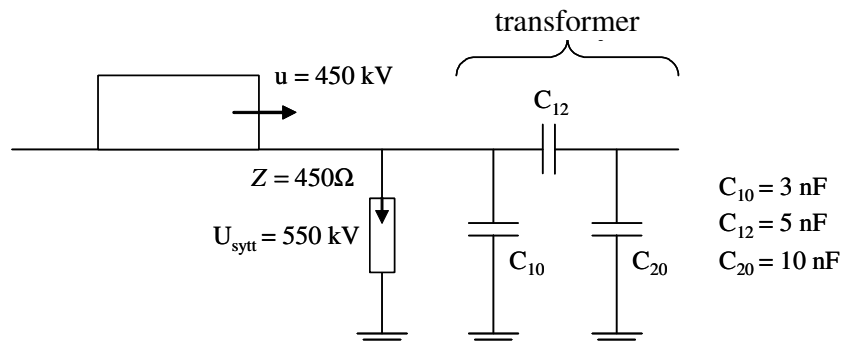


Exercise 4

- When a no-load (idle) cable or a storage capacitor is switched off a capacitive current disruption occurs. Derive the maximum recovery voltage between the switch terminals.



- An overhead line has characteristic impedance of 450Ω . A 200 kV rectangular impulse 10 km in length propagates along the line. What is the energy of the impulse? How much of the energy is in the magnetic field and how much is in the electric field?
- A step wave with amplitude 450 kV propagates along an overhead line to a $110/20 \text{ kV}$ transformer. The line has characteristic impedance of 450Ω . The primary winding is protected from phase to ground by a nonlinear resistor type arrester with inception voltage of 550 kV . How soon after overvoltage does the arrester activate? How large capacitors have to be connected to the secondary winding and ground so that the capacitive overvoltage over the transformer does not exceed the secondary test voltage of 75 kV ? The transformer can be described as a capacitive equivalent circuit used for impulse voltage testing.



- A 110 kV transformer connected to an overhead grid is protected by a nonlinear resistor type interrupter as shown in the figure. Inception voltage and residual voltage (constant) is 400 kV . Distance between the transformer and interrupter is 30 m . A lightning stroke produces a wedge wave propagating along the overhead line with steepness of $1000 \text{ kV}/\mu\text{s}$. Determine the voltage strain experienced by the transformer and the inception time of the interrupter when the transformer is represented as surge capacitance $C = 0$. How far can the interrupter be placed from the transformer if the transformer can withstand 550 kV ?

