MECH0064 MSc Group Design Project

Compact Continuum Robotic Manipulator Platform

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1 Question 1. Diode bridge circuit (4%)

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2 Question 1. Diode bridge circuit (4%)

2.1 The circuit diagram from PSCAD

The screen capture of the circuit diagram from PSCAD is shown in Figure 1.

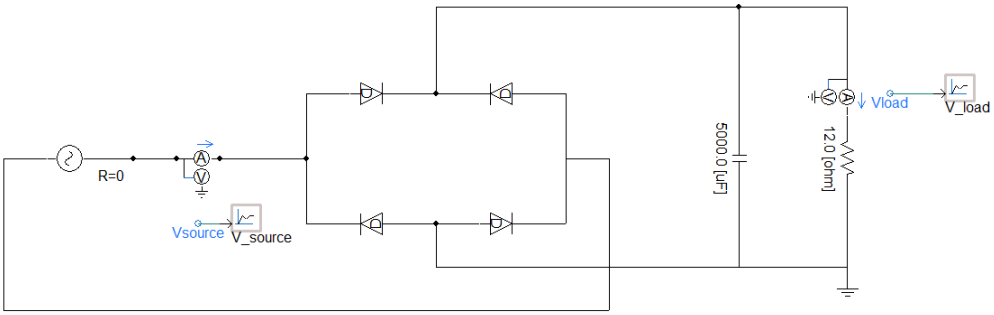
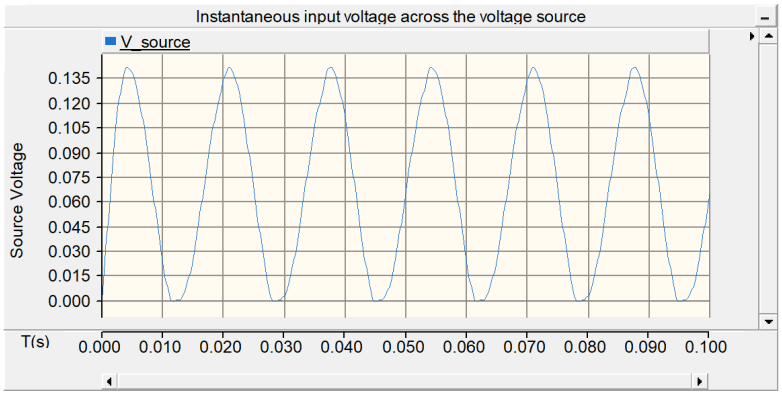


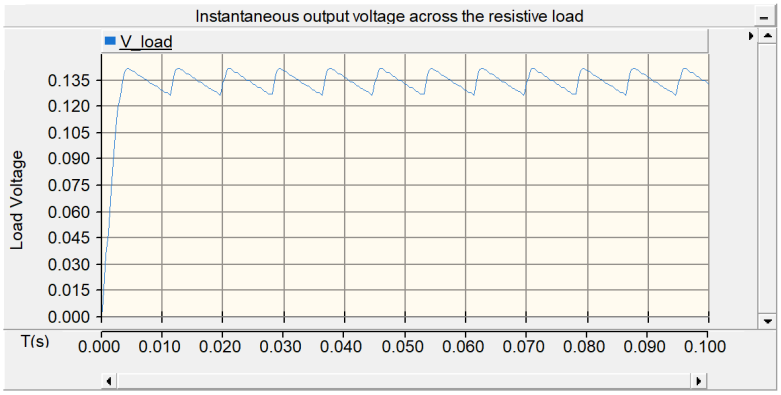
Figure 1 ***The circuit diagram:*** Screen capture about Question 1-a in PSCAD

2.2 The instantaneous voltage measurement (5mF)

The screen capture of the circuit diagram from PSCAD is shown in Figure 2.



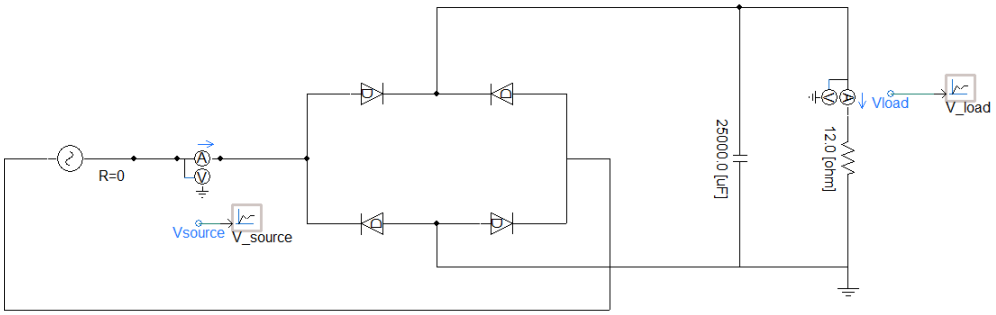
(a) The instantaneous input voltage across the voltage source (unit: kV)



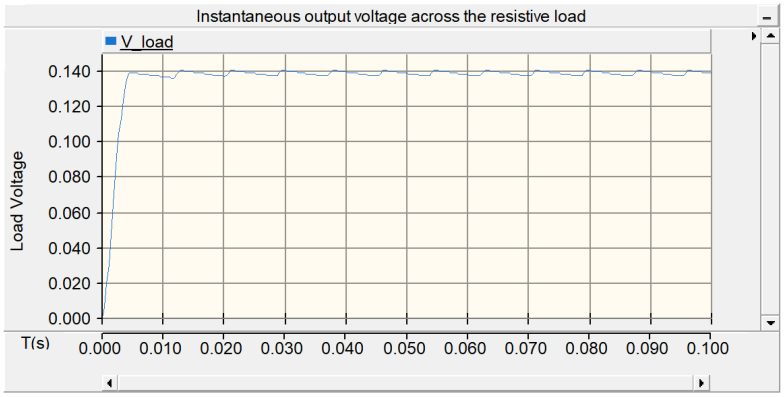
(b) The instantaneous output voltage across the resistive load (unit: kV)

Figure 2 ***The measured instantaneous voltages:*** V_{source} and R_{load}

2.3 The instantaneous voltage measurement (25mF)



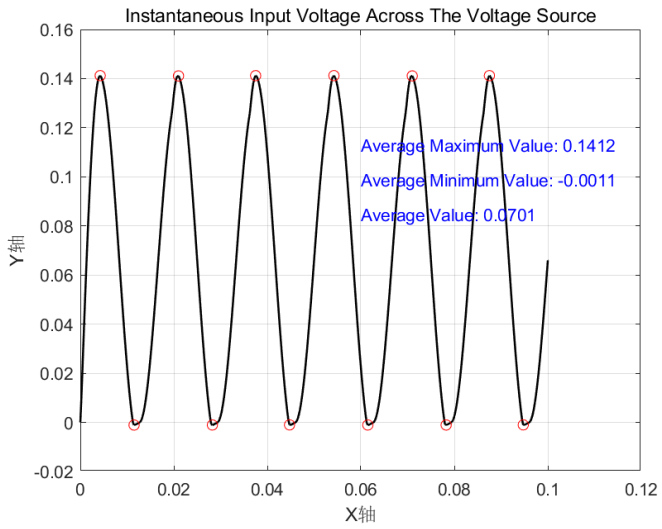
(a) The circuit diagram with different capacitor



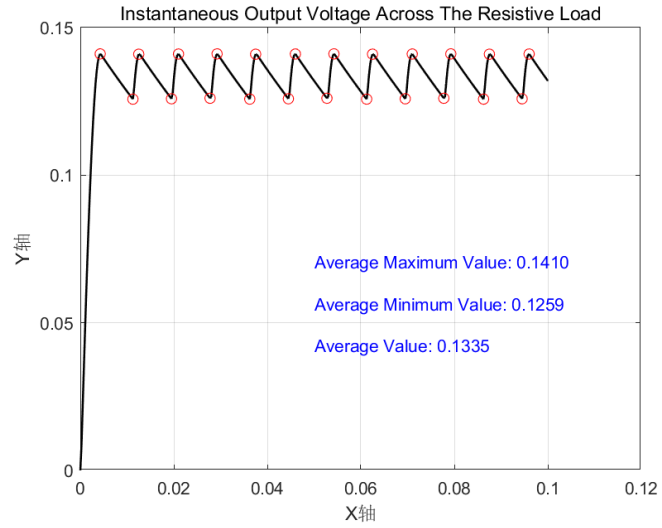
(b) The instantaneous output voltage across the resistive load (unit: kV)

Figure 3 ***The measured instantaneous voltages:*** $R_{load}$with 25mF

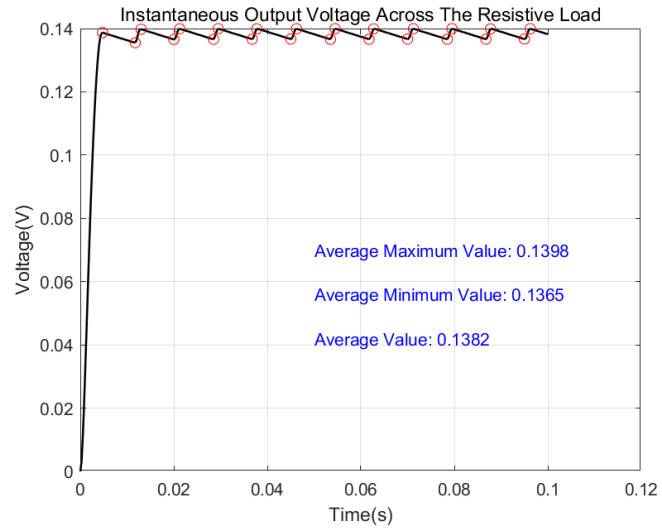
To make further analysis about the impact of different capacitors on the entire circuit, the data in Figure 2a, 2b, and 3b are exported to MATLAB. The peaks of the measured instantaneous voltage are labeled and the average values are plotted in Figure 4. The purpose of increasing the capacitance is to reduce circuit oscillations caused by the AC power source and reduce steady state error. It can be observed in Figure 4 that with a larger capacitor, the instantaneous voltage fluctuations across the resistive load are smaller, leading to a comparatively more stable condition.



(a) The instantaneous input voltage across the voltage source in MATLAB



(b) The instantaneous output voltage across the resistive load (5mF) in MATLAB



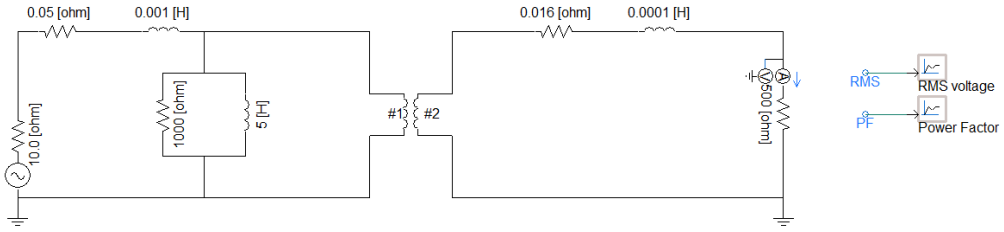
(c) The instantaneous output voltage across the resistive load (25mF) in MATLAB

Figure 4 ***The processed instantaneous voltages:*** Processed in MATLAB, the unit in the MATLAB plots are kiloVolt(kV)

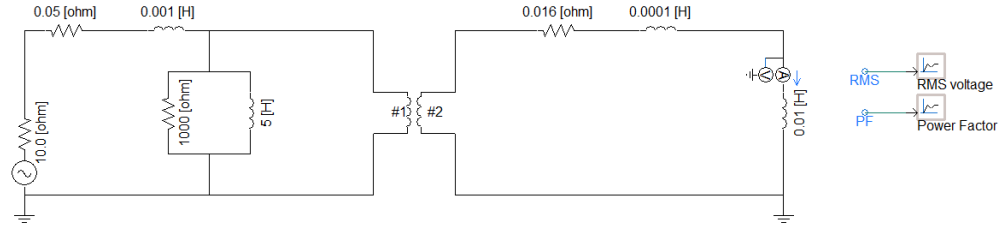
3 Question 2. Equivalent transformer (4%)

3.1 The circuit diagram from PSCAD

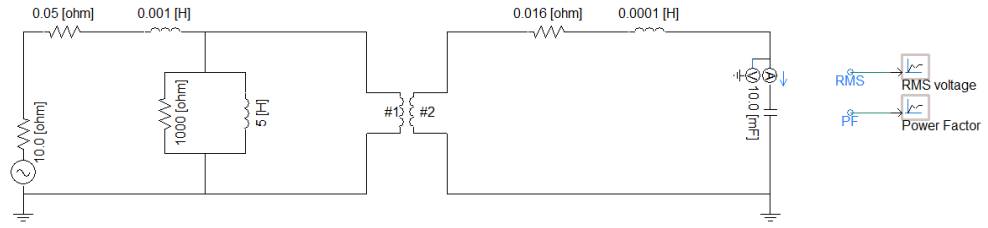
The screen capture of the circuit diagram from PSCAD about the resistive, inductive, and capacitive laod are shown in Figure 5a, 5b, and 5c respectively.



(a) The circuit diagram with the resistive load



(b) The circuit diagram with the inductive load

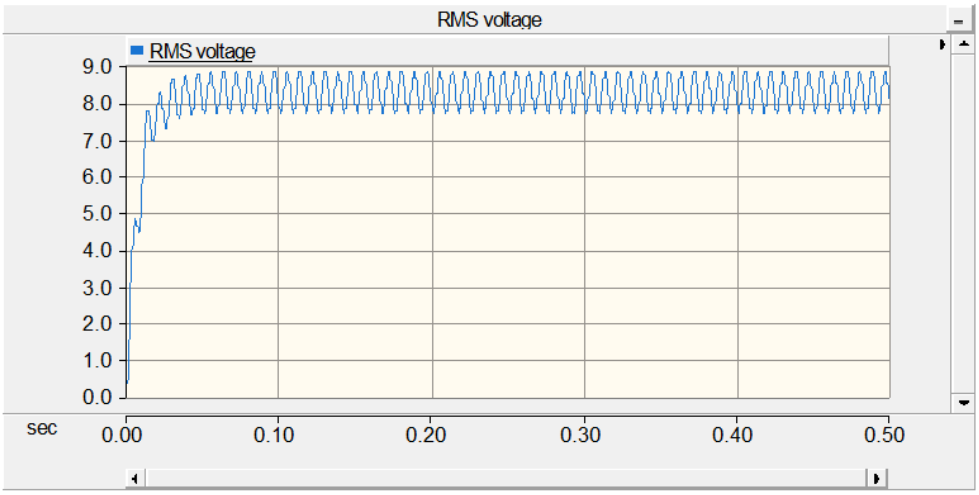


(c) The circuit diagram with the capacitive load

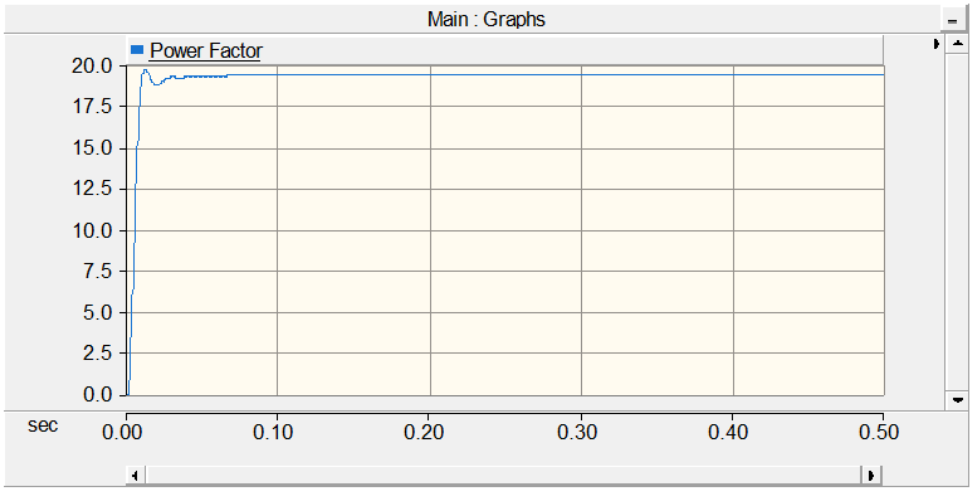
Figure 5 ***The circuit diagrams:*** resistive, inductive, and capacitive load

3.2 The measurement across the resistive load

The RMS voltage (analogue) and power factor (angular) about the resistive laod are shown in Figure 6a and 6b.



(a) The RMS voltage about the resistive load (unit: kV)

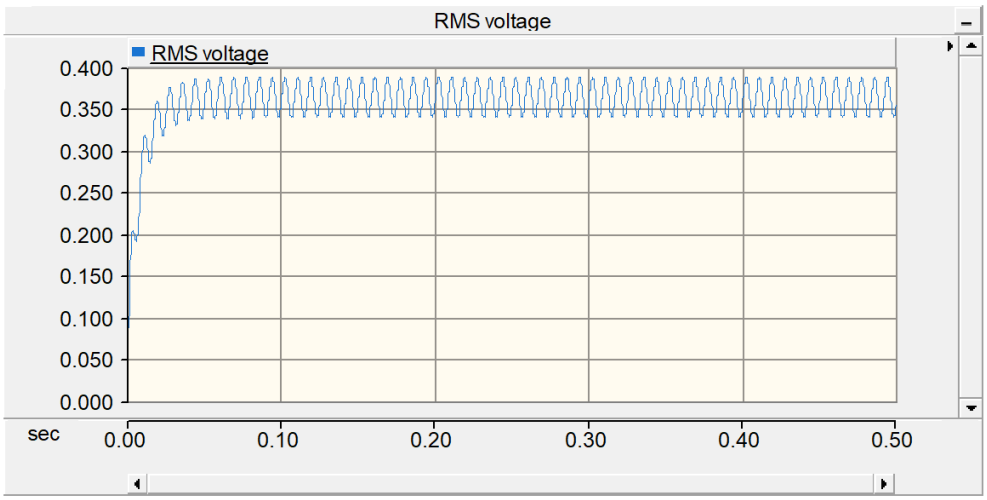


(b) The power factor about the resistive load (unit: degree °)

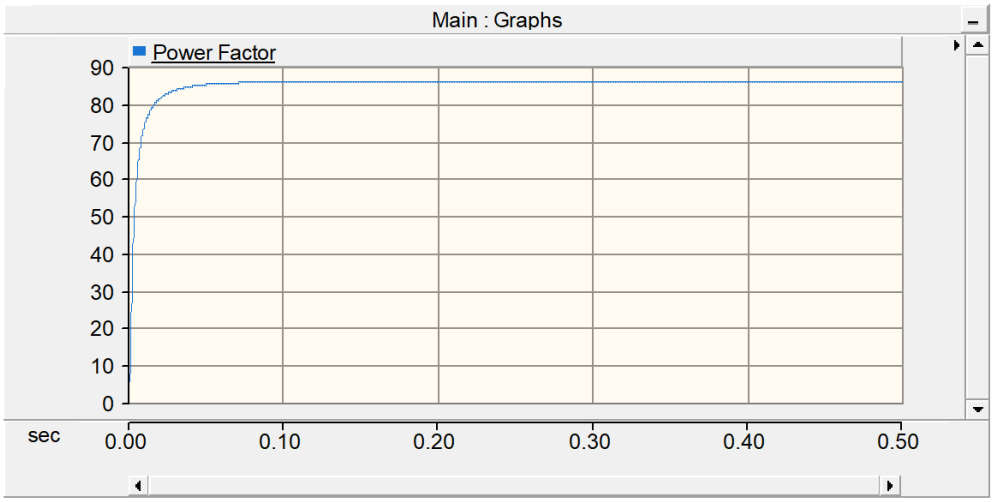
Figure 6 ***The measurements about the resistive load:*** RMS Voltage(analogue) and Power Factor(angular)

3.3 The measurement across the inductive load

The RMS voltage (analogue) and power factor (angular) about the inductive laod are shown in Figure 7a and 7b.



(a) The RMS voltage about the inductive load (unit: kV)

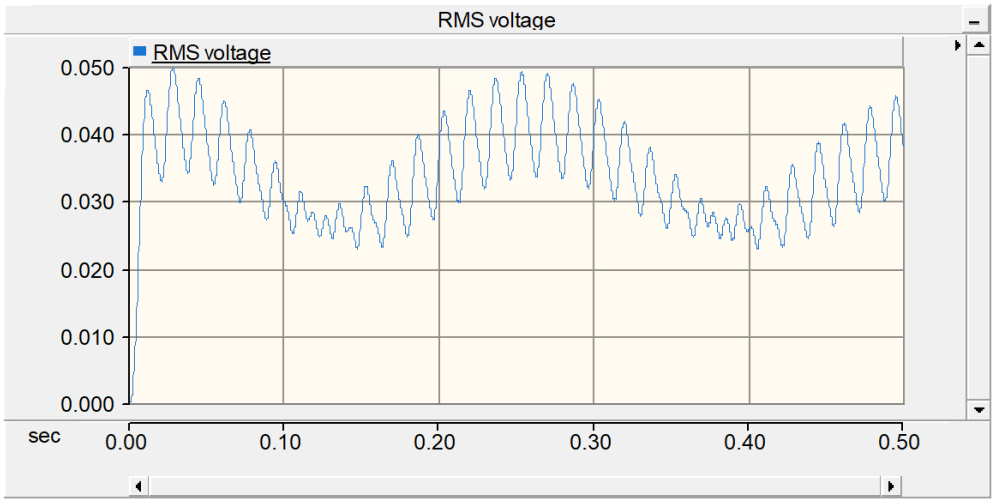


(b) The power factor about the inductive load (unit: degree °)

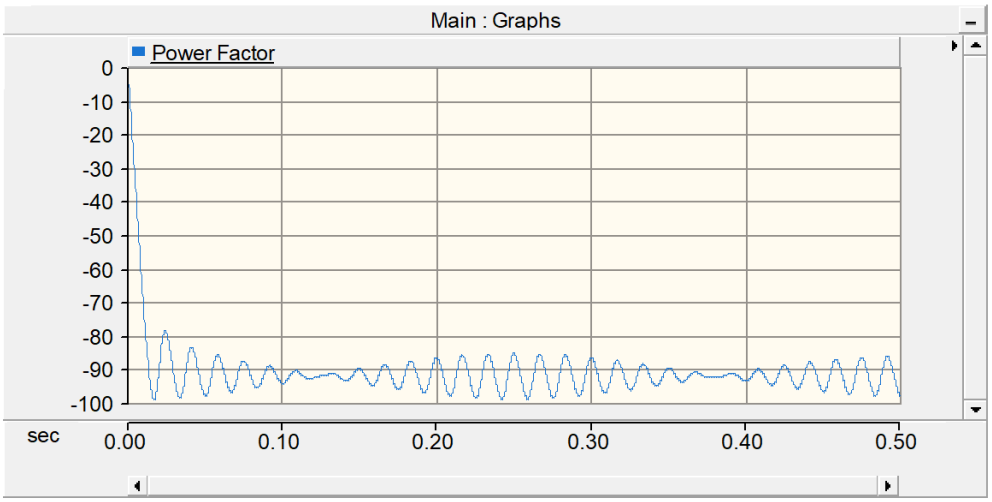
Figure 7 ***The measurements about the inductive load:*** RMS Voltage(analogue) and Power Factor(angular)

3.4 The measurement across the capacitive load

The RMS voltage (analogue) and power factor (angular) about the capacitive laod are shown in Figure 8a and 8b.



(a) The RMS voltage about the capacitive load (unit: kV)



(b) The power factor about the capacitive load (unit: degree °)

Figure 8 ***The measurements about the capacitive load:*** RMS Voltage(analogue) and Power Factor(angular)

4 Question 3. Faulted 3-Φ network PART 1 (4%)

5 Question 4. Faulted 3-Φ network PART 2 (5%)

6 Question 5. Faulted 3-Φ network PART 3 (8%)

7 Question 6. . Faulted Network Analysis (10%)