

**Birzeit University**

**Faculty of Engineering & Techonology**

**Department of Electrical & Computer Engineering**

**ENEE211**

**“**Impedance and Sinusoidal Steady State**”**

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1.To Calculate Vc(t) using PSpice , we need to find phase and magnitude of Vc(t) , to do that ; insert VPRINT2 between VA and the ground .to print the magnitude and phase of Vc(t) ,set VPRINT2 part names : AC ,Mag, and Phase to yes . To perform simulation at single-frequency, set Start Freq = 50Hz, and Final Freq = 50Hz in the AC sweep analysis part.

2. Vi (t) =4\*cos (100\*pi\*t-90)(Phasor domain form), set ACMAG=4V, ACPHASE=-90

The circuit is as below with everything above taken into consideration

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The output file of PSpice contains the following for every resistance from 1k to 10k ohms.

When Param B =1k

 FREQ VM (VA,0) VP(VA,0)

 5.000E+01 3.291E+00 -1.247E+02

 **Vc(t) = 3.291\*cos(100\*pi\*t -124.7)= 3.291\*sin(100\*pi\*t-34.7)**

**Phase difference = 34.7**

When the PARAM B =2k ,the magnitude and phase for Vc(t) as appear in output File of PSpice are:

 FREQ VM(VA,0) VP(VA,0)

 5.000E+01 2.345E+00 -1.441E+02

**Vc(t) = 2.345\*cos(100\*pi\*t -144.1)= 2.345\*sin(100\*pi\*t-54.1)**

**Phase difference = 54.1**

When the PARAM B =3k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:

 FREQ VM(VA,0) VP(VA,0)

 5.000E+01 1.738E+00 -1.543E+02

**Vc(t) = 1.738\*cos(100\*pi\*t -154.3)= 1.738\*sin(100\*pi\*t-64.3)**

**Phase difference = 64.3**

When the PARAM B =4k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 1.361\*cos(100\*pi\*t -160.1)= 1.361\*sin(100\*pi\*t-70.1)**

**Phase difference = 70.1**

When the PARAM B =5k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:

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**Vc(t) = 1.112\*cos(100\*pi\*t -163.9)= 1.112\*sin(100\*pi\*t-73.9) / Phase difference = 73.9**

When the PARAM B =6k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 0.9377\*cos(100\*pi\*t -166.4)= 1.361\*sin(100\*pi\*t-76.4)**

**Phase difference = 76.4**

When the PARAM B =7k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 0.8097\*cos(100\*pi\*t -168.3)= 0.8097\*sin(100\*pi\*t-78.3)**

**Phase difference = 78.3**

When the PARAM B =8k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 0.7119\*cos(100\*pi\*t -169.7)= 0.7119\*sin(100\*pi\*t-79.7)**

**Phase difference = 79.7**

When the PARAM B =9k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 0.6349\*cos(100\*pi\*t -170.9)= 0.6349\*sin(100\*pi\*t-80.9)**

**Phase difference = 80.9**

And finally when the PARAM B =10k, the magnitude and phase for Vc(t) as appear in output File of PSpice are:



**Vc(t) = 0.5728\*cos(100\*pi\*t -171.8)= 0.5728\*sin(100\*pi\*t-81.8)**

**Phase difference = 81.8**

**The waveforms are as shown below:-**

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4. Like the previous setting exactly, but only change the magnitude of the input sinusoidal to 5V. And change c to L=100uH.Vi (t) =5\*sin (2000\*pi\*t)

 = 5\*cos (2000\*pi\*t-90)



**Using the output File, the Phase and Magnitude are as found below:-**

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VL(t)= 2.66\*cos(2000\*pi\*t-32.1) =2.66\*sin(2000\*pi+57.9)

$$∅=57.9$$

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VL(t)= 1.499\*cos(2000\*pi\*t-17.44) =1.499\*sin(2000\*pi+72.56)

$∅=$**72.56**

****

VL(t)= 1.02\*cos(2000\*pi\*t-11.8) =1.02\*sin(2000\*pi+78.2)

$∅=$**78.2**

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VL (t) =0.77 \*cos(2000\*pi\*t-8.9) =0.77\*sin(2000\*pi+81.1)

$∅=$**81.1**

****

VL (t) = 0.62\*cos(2000\*pi\*t-7.1) =0.62\*sin(2000\*pi+82.9)

$∅=$**82.9**

****

VL(t)= 0.52\*cos(2000\*pi\*t-5.9) =0.52\*sin(2000\*pi+84.1)

$∅=$**84.1**

****

VL(t)= 0.44\*cos(2000\*pi\*t-5.1) =0.44\*sin(2000\*pi+84.9)

$∅=$**84.9**

****

VL(t)= 0.39\*cos(2000\*pi\*t-4.4) =0.39\*sin(2000\*pi+85.6)

$∅=$**85.6**

****

VL(t)= 0.34\*cos(2000\*pi\*t-3.9) =0.34\*sin(2000\*pi+86.1)

$∅=$**86.1**

****

VL(t)= 0.31\*cos(2000\*pi\*t-3.5) =0.31\*sin(2000\*pi+86.5)

$∅=$**86.5**

**7)**

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**F=800Hz ,the output file has the magnitude of I and V.**

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**|Z|=|V|/|I|=0.7/5.192m=134.8ohm**

**F=1600Hz**

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**|Z|=|V|/|I|=0.7/6.378m=109.7ohm**

**F=3200Hz**

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**|Z|=|V|/|I|=0.7/6.828m=102.5ohm**

**F=6400Hz**

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**|Z|=|V|/|I|=0.7/6.956m=100.6ohm**

 **Z Vs Freq**

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**10.) **

**For f=50Hz, the Magnitude of current and voltage were obtained from the output file as below:-**

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**|Z|=|V|/|I| = 0.14/1.336m = 104.8 ohm**

**F=100Hz**

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**|Z|=|V|/|I|=0.14/1.185=118.1ohm**

**F=200Hz**



**|Z|=|V|/|I|=0.14/0.8717m= 160.6ohm**

**F=400Hz**

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**|Z|=|V|/|I|=0.14/0.5176m = 270 ohm**

**F=800Hz**

****

**|Z|=|V|/|I|=0.14/0.2732m=512.4ohm**

 **F=1600Hz**

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**|Z|=|V|/|I|=0.14/0.0.1386m=1010ohm**

 **Z Vs Freq**

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