Electrical Engineering Department

Circuit analysis

Pspice assignment

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Question 1:

For the circuit shown below, use Pspice to find Vo and the power absorbed/delivered by the 0.125Ω resistor and VCVS 2Vo

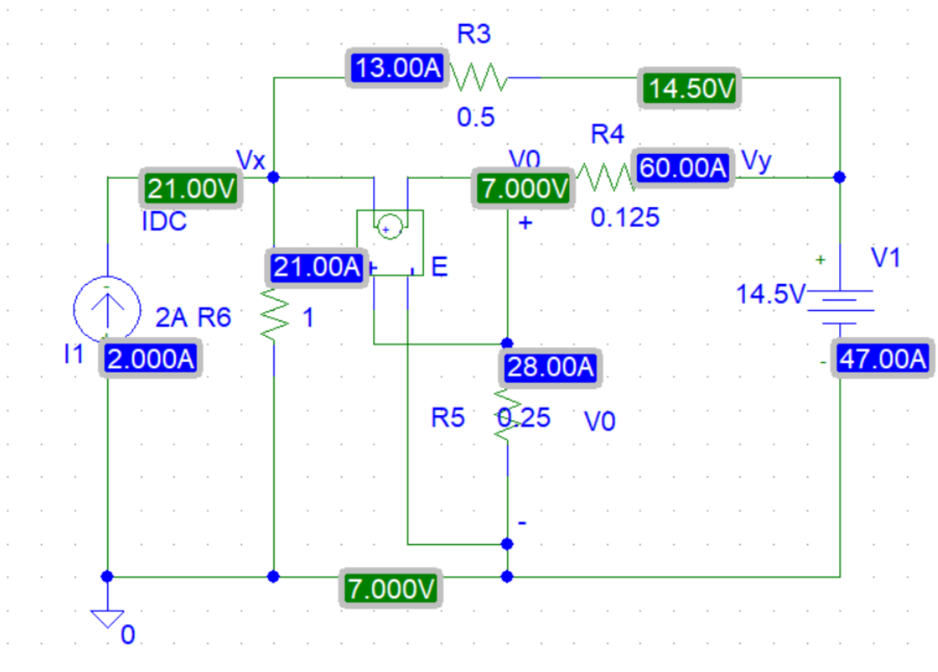

Fig.1.1

As shown in the figure 1.1:

V0= 7v

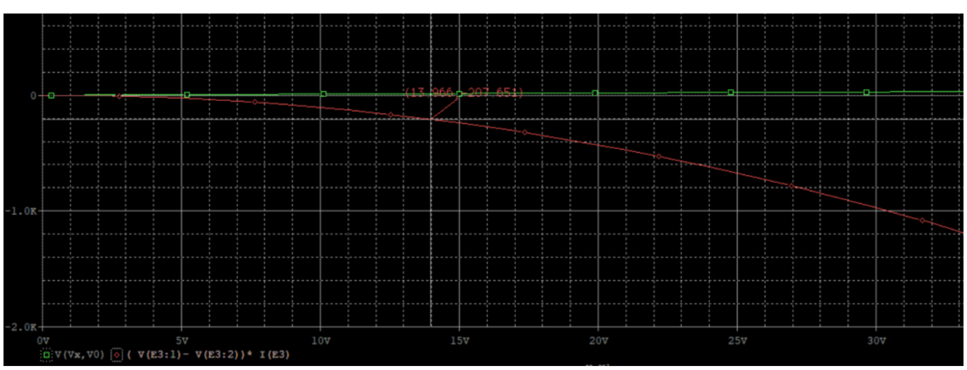

Fig1.2.1

As shown in fig.1.2.1 and its representation in fig.1.2.1:

We need power at 2V0=14v

So P(at 2v0)=-208 W (delevired)

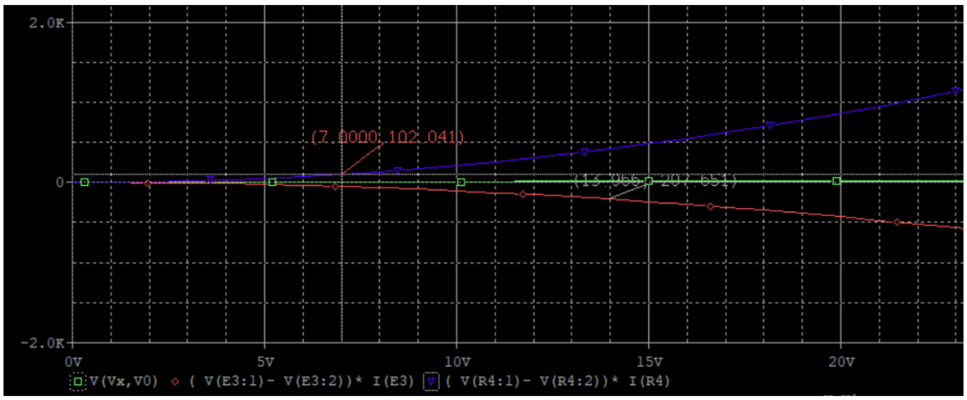

Fig.1.2.2

P at R=0.125, P=102 W (absorbed)

<u>Question 2:</u>

Determine the steady state voltage vo(t) for the circuit shown below using Pspice :

20cos(5t)=20sin(5t-π/2)

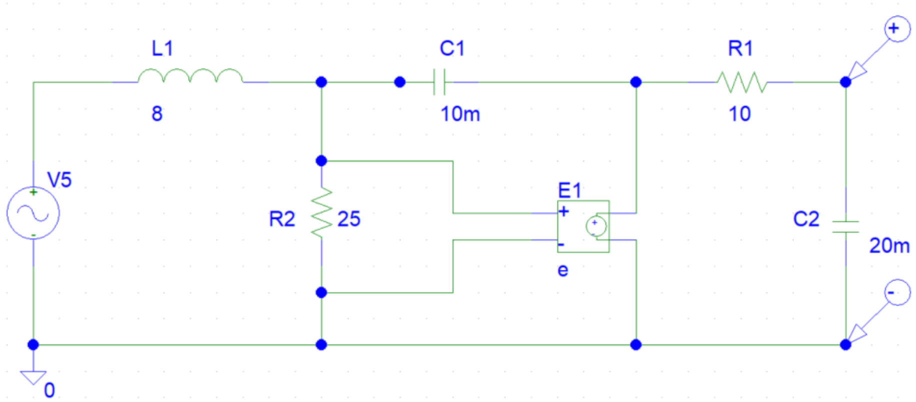

Fig.2.1

As shown in fig.2.1, after simulating it at transient we get:

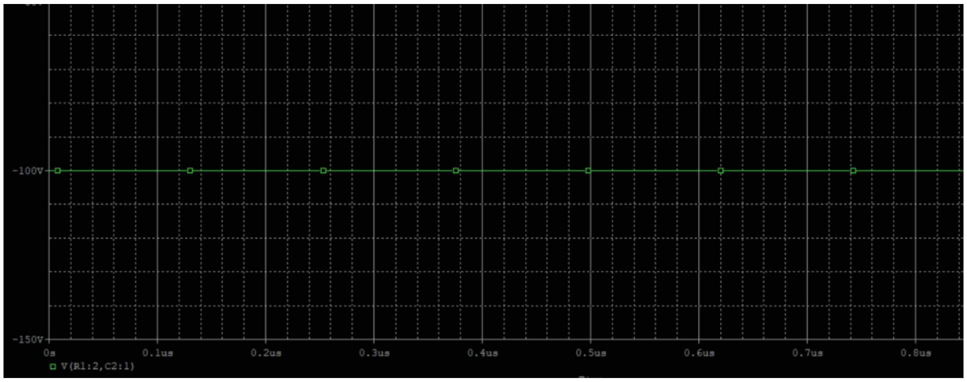

Fig.2.2

As shown in fig.2.2 the votage v0(t)=-100V

Question 3:

- Using Pspice, determine: the current iL(t) for t > 0 for the circuit in fig.3.1

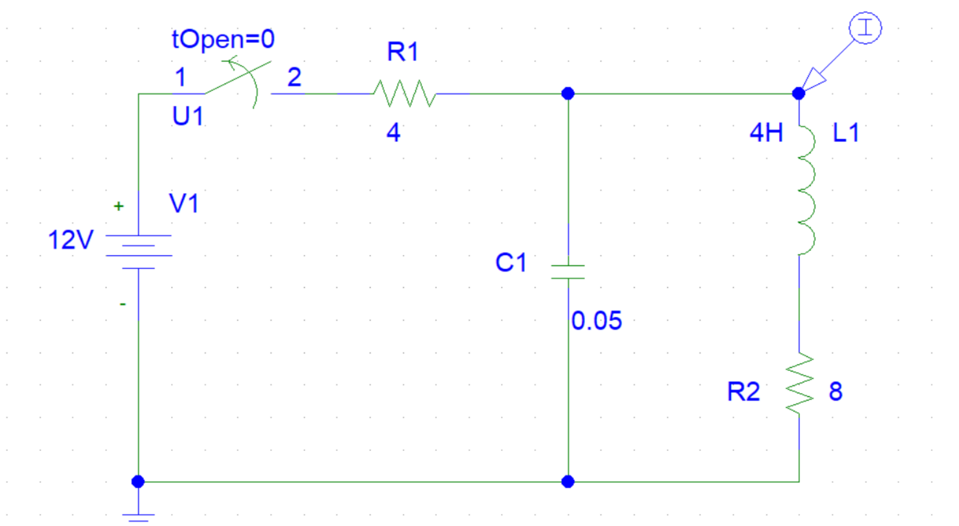

Fig.3.1.1

As shown in fig.3.1 we can find iL(t) for t>0 by turning on bias current display:

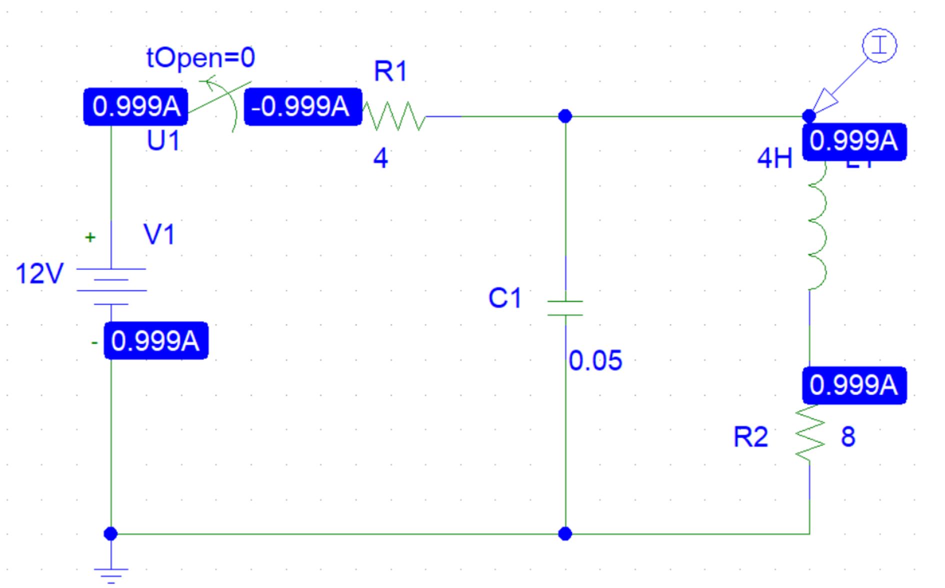

Fig.3.1.2

- Using Pspice, determine: the voltage vo(t) for the circuit in fig.3.2

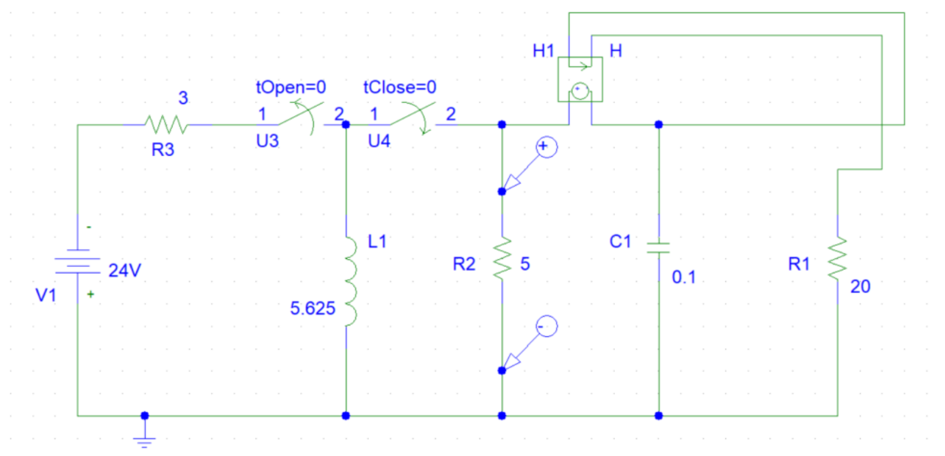

Fig.3.2.1

To get v0 at R2:

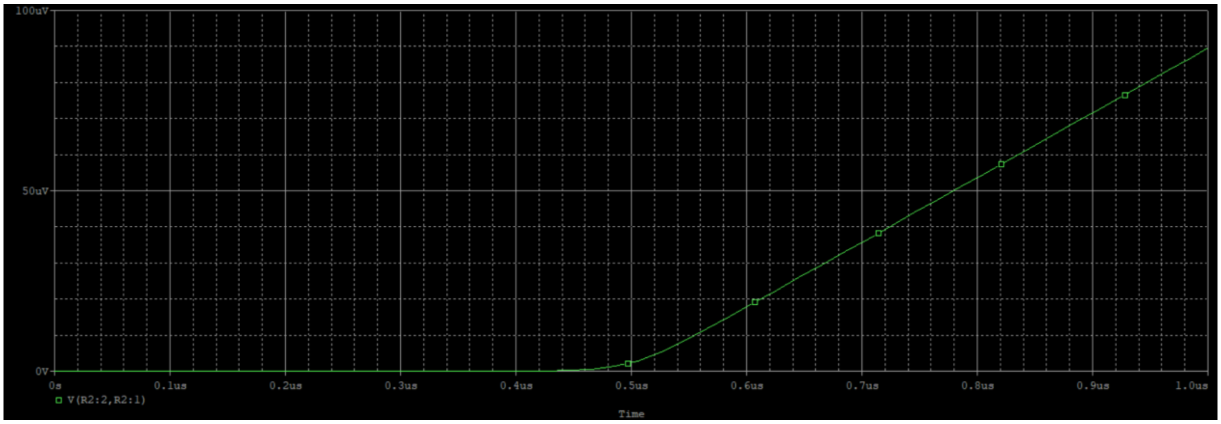

Fig.3.2.2

Question 5:

- Design a passive RC low pass filter with a cutoff frequency of 3000 Hz?

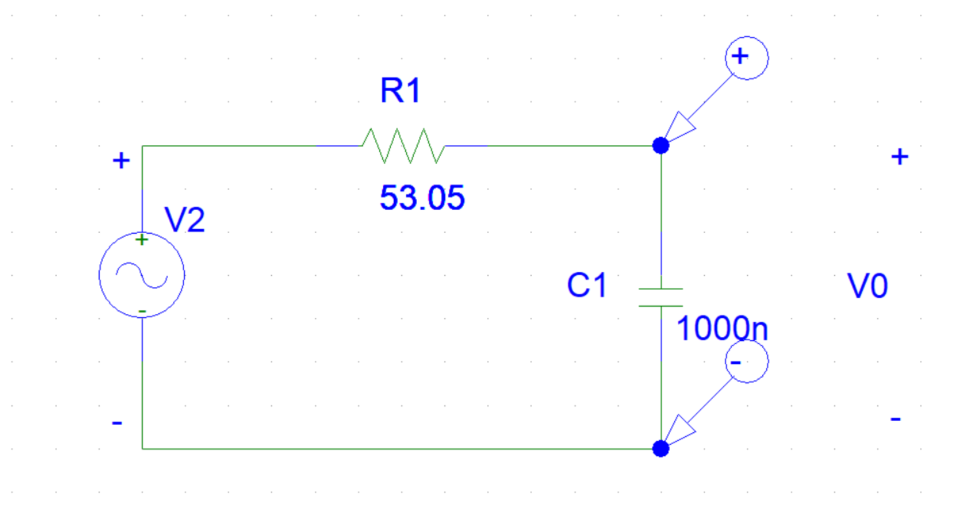

Fig.5.1

Fc=1/(2πRC),   fc=3000Hz and let C= 1μF

Therefore R=1/(2πCFc)=1/(2π(1μ)(3000))=53.05Ω

- A bandpass filter has resonant frequency of 40krad/s and a quality factor of 5. Find the bandwidth, the upper cutoff frequency, and the lower cutoff frequency. Express all answers in kilohertz.

W0=40,000 , then f0=6366.2Hz

Q=5 ,

Then: $B=f0/Q=1273.238Hz$

Finding upper cutoff frequency:

$Fh=f0+B/2=7002Hz$

Finding lower cutoff frequency:

$Fl=f0-B/2=5279.7Hz$

To find L, let C=1F ----> $f0=1/(2\pi*\mathrm{sqrt}(LC))$

We get L=6.25 H

And $Q=(2\pi f0L)/R$ ----> $R=5k\Omega$

The circuit will be:

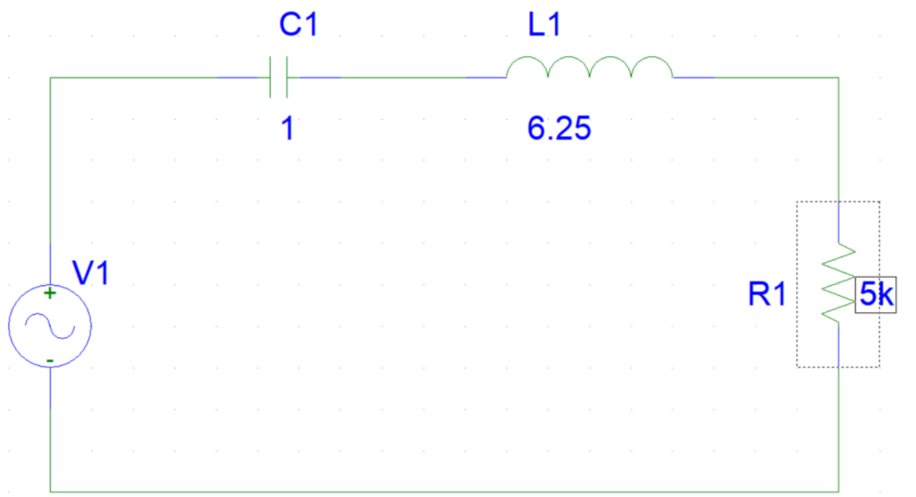

Fig5.2

Question 6:

The circuit shown in Figure below has two inputs, vs(t) and is(t), and one output, v(t). When inputs are

given by Vs(t)= Vm sin 6t V and is(t)= Im A

the output will be

$vo(t)=A\sin(6t+\alpha) + B$ V

Linearity requires that A be proportional to Vm and that B be proportional to Im. Consequently, we can

write A= k1.Vm and B= k2.Im, where k1 and k2 are constants yet to be determined.

(a) Use PSpice to determine the value of k1 by simulating the circuit, using Vm =1 V and Im= 0.

Ans:

After building the circuit and put Vm=1 and Im=0 as shown in fig6.1

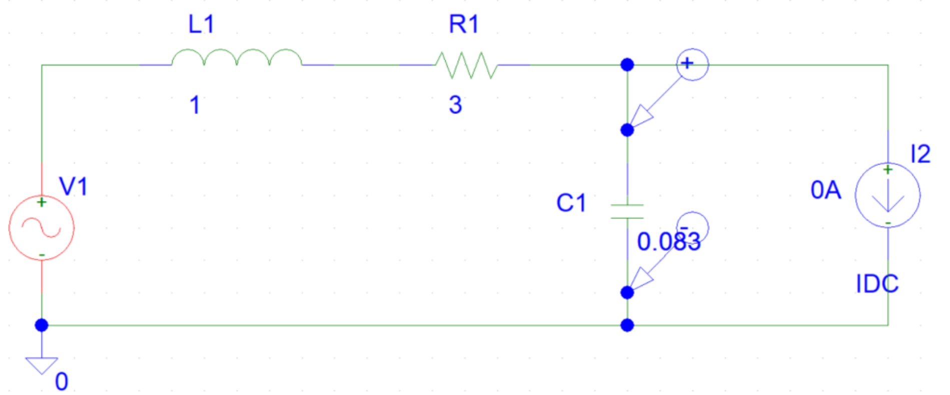

Fig6.1

After simulating the circuit as shown in the figure 6.1.1:

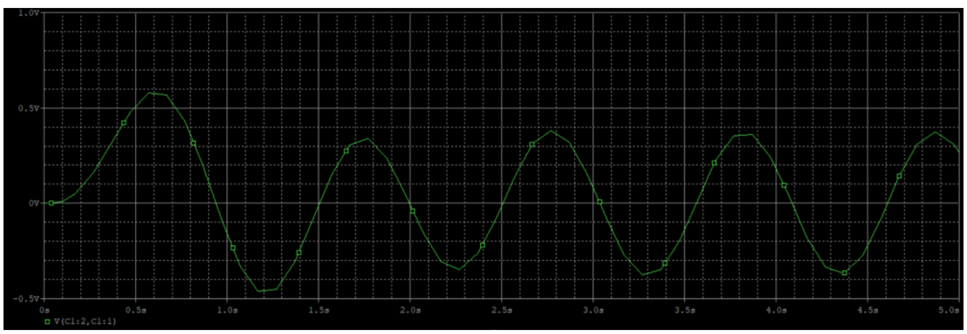

Fig6.1.1

We can see that the peak=0.405v

So K1=0.405/1=0.405

(b) Use PSpice to determine the value of k2 by simulating the circuit, using Vm =0 V and Im= 1.

After building the circuit and put Vm=0 and Im=1 as shown in the fig6.2:

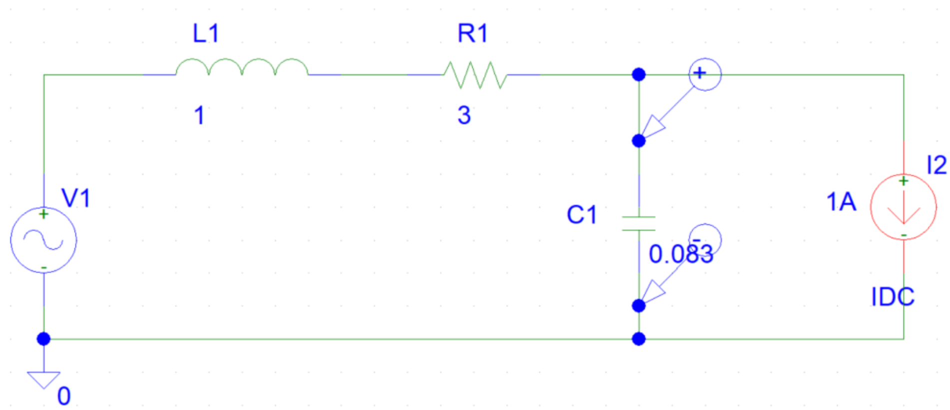

Fig6.2

After simulating the circuit as shown in fig6.2.1:

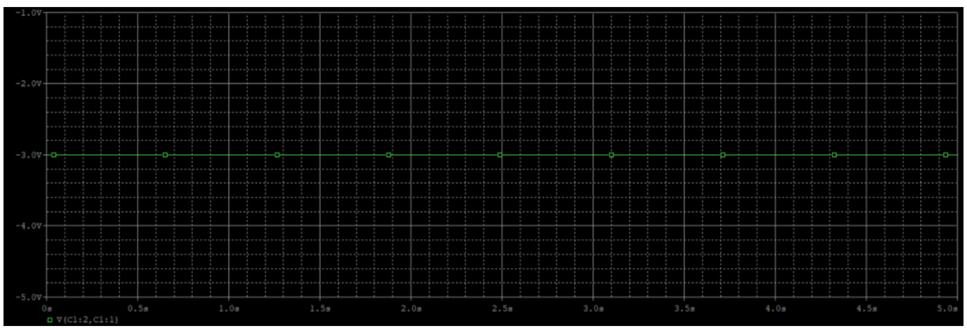

Fig6.2.1

We can see that the peak= -3

So K2=-3/1=-3

(c) Knowing k1 and k2, specify the values of Vm and Im that are required to cause vo(t)=5 sin(6t+α) + 5

As we got: k1=0.405 and k2=-3

A=0.405*Vm=5 so Vm=12.35 V

And B=(-3)Im=5 so Im=-1.67 V

Is=(-1.67)*5=-8.35 A

V . Simulate the circuit, using PSpice to verify the specified values of Vm and Im.

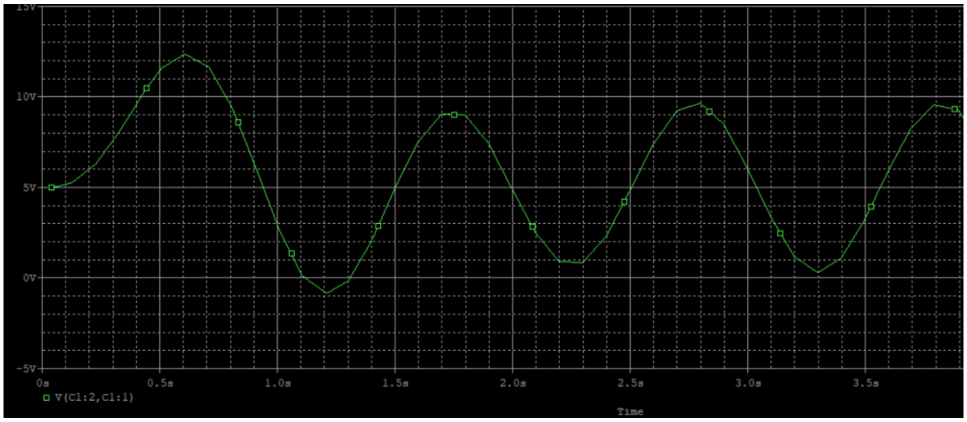

Fig6.3

(d) Determine the average power delivered by vs(t) using Pspice.

After putting voltage differential markers at Vs(t) and simulating it :

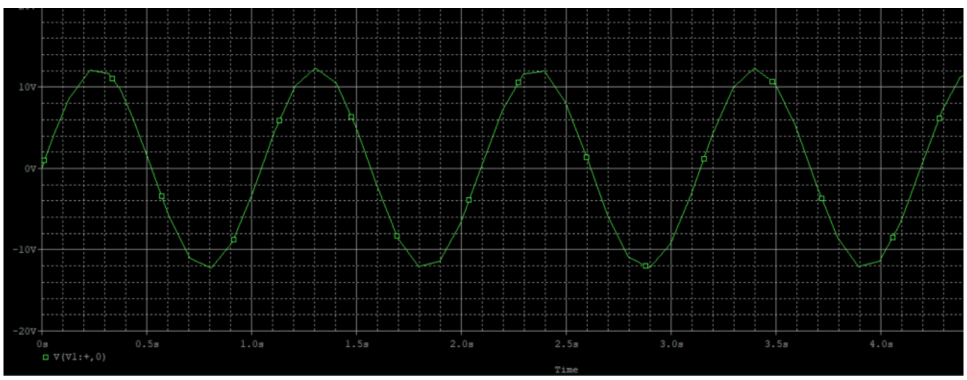

Fig6.4