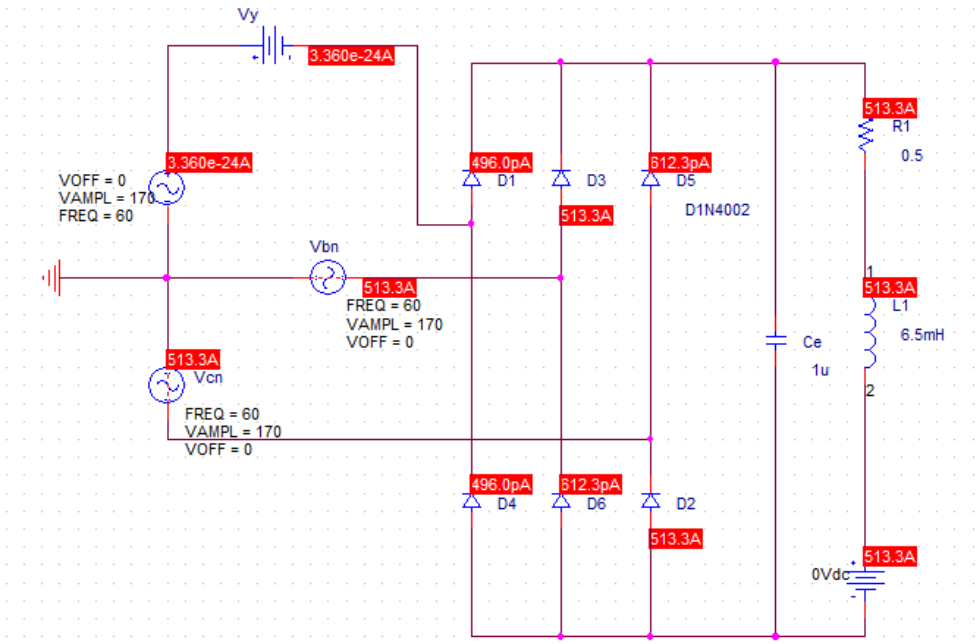
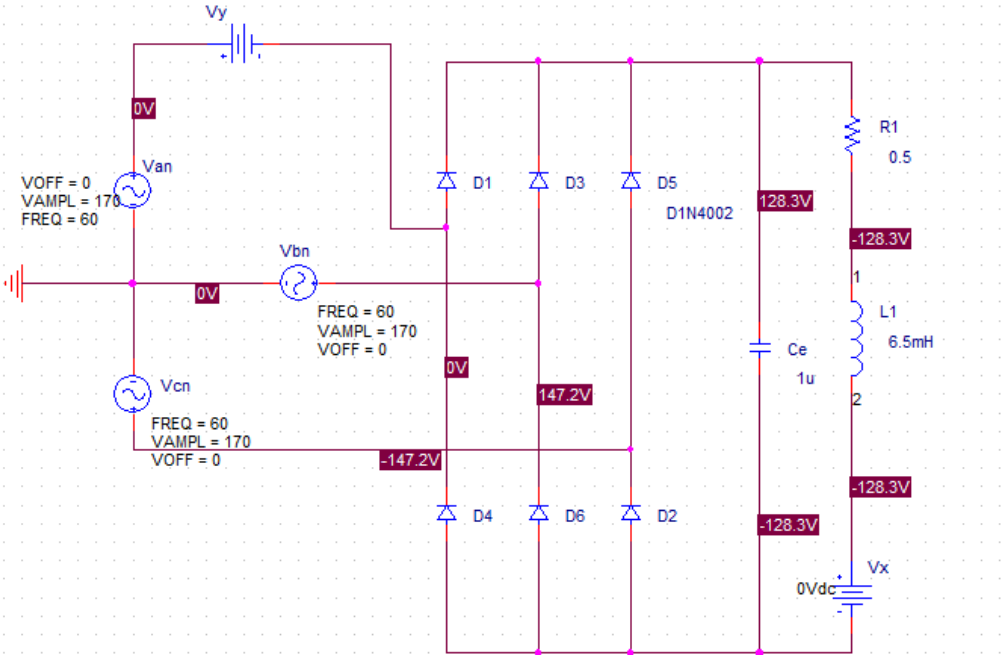
EE-368 Power Electronics

Uncontrolled Three Phase Rectifiers

INTRODUCTION:

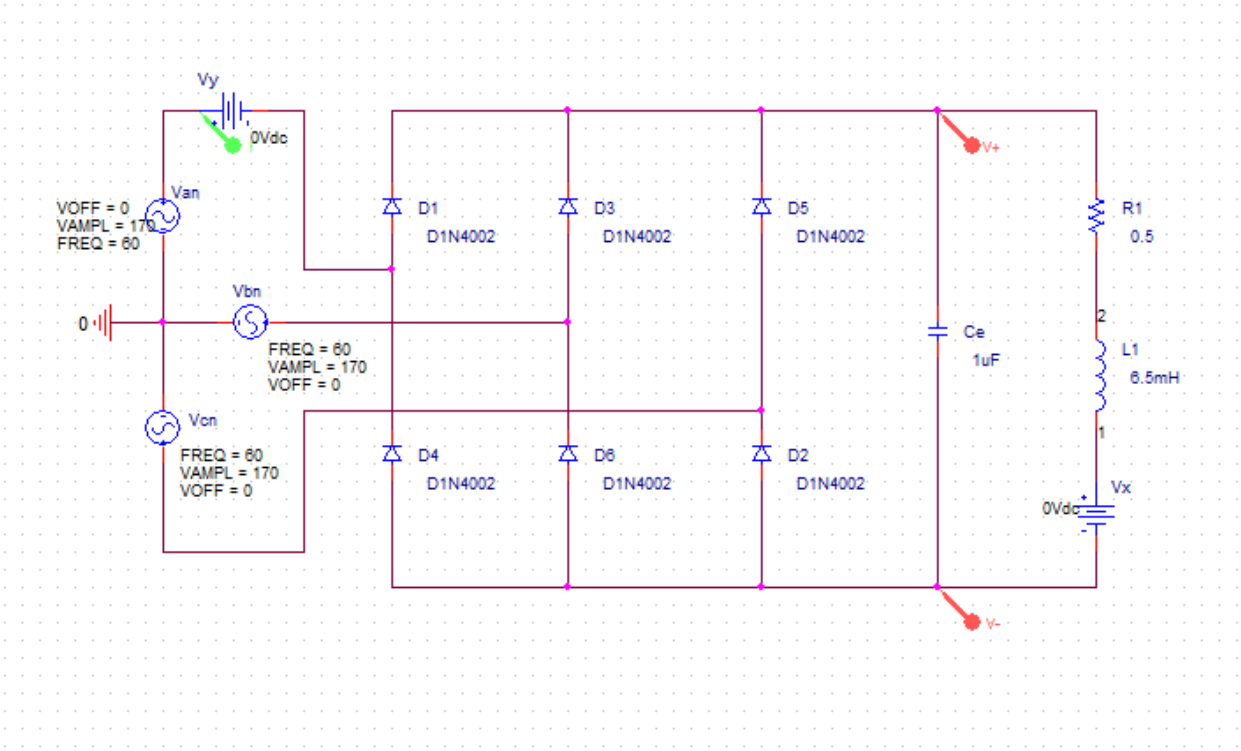
In this lab, we will learn about the three phase uncontrolled rectifiers. The circuit of three phase diode rectifier will be implemented in PSPICE. The operation of circuit will be observed alongwith the calculation of different parameters.



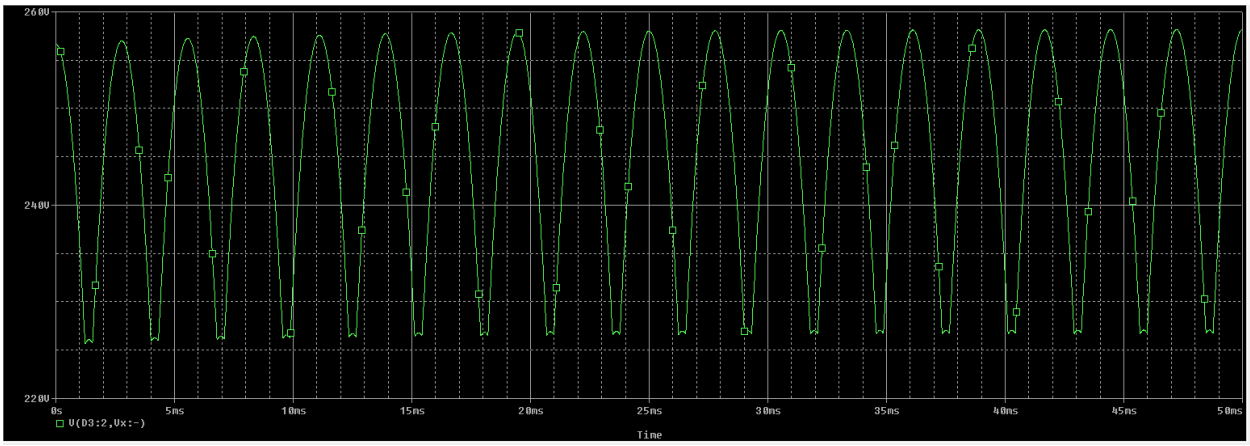


Part A

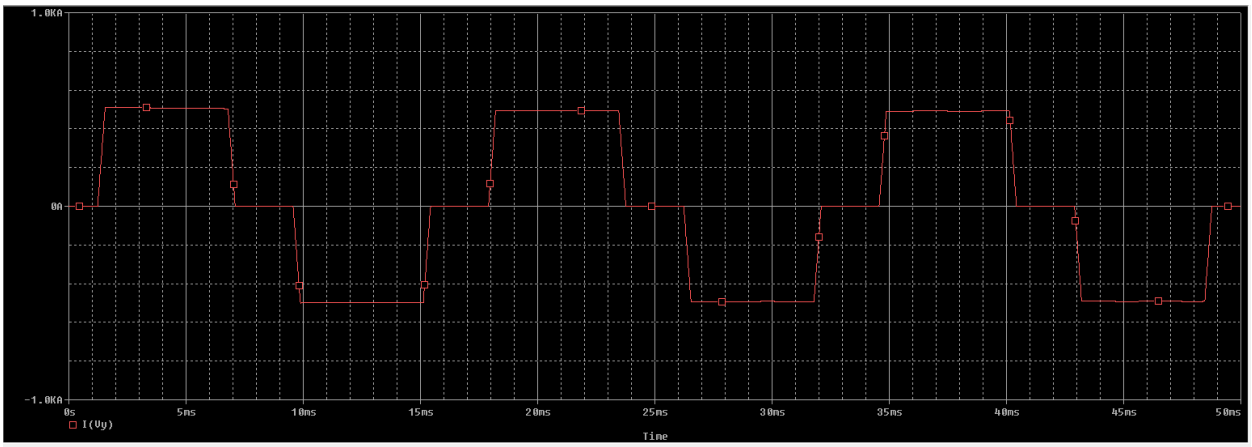
Circuit Diagram PSPICE:



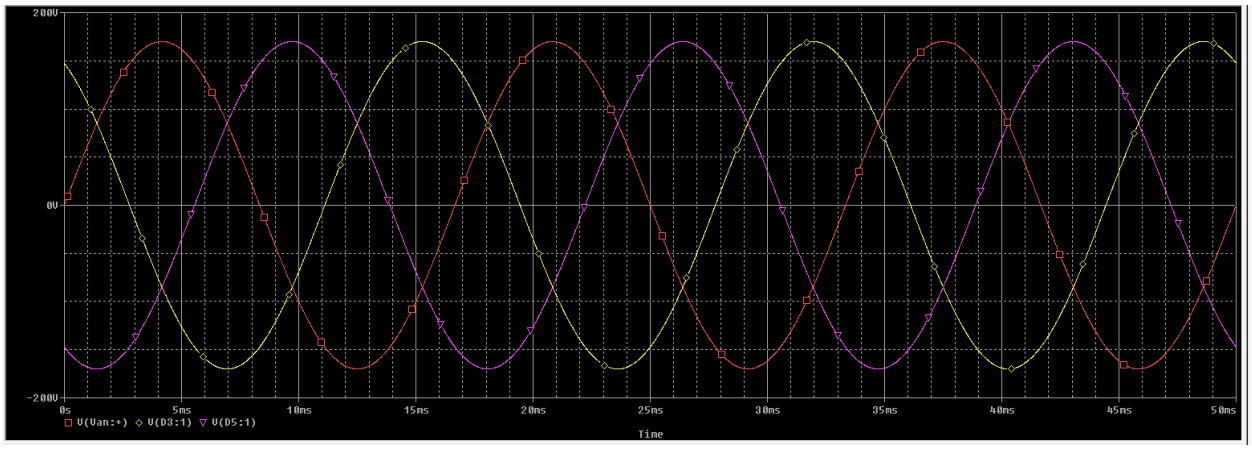
Instantaneous Output voltage



Input line current:

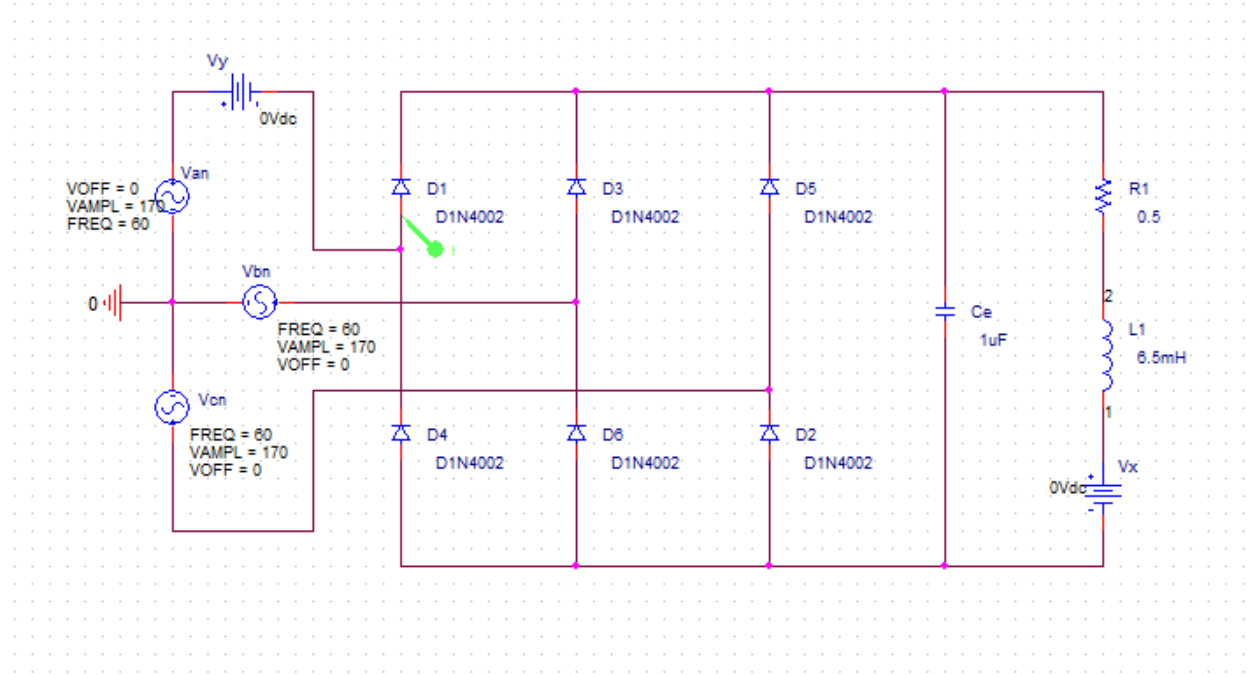


Phase Voltages

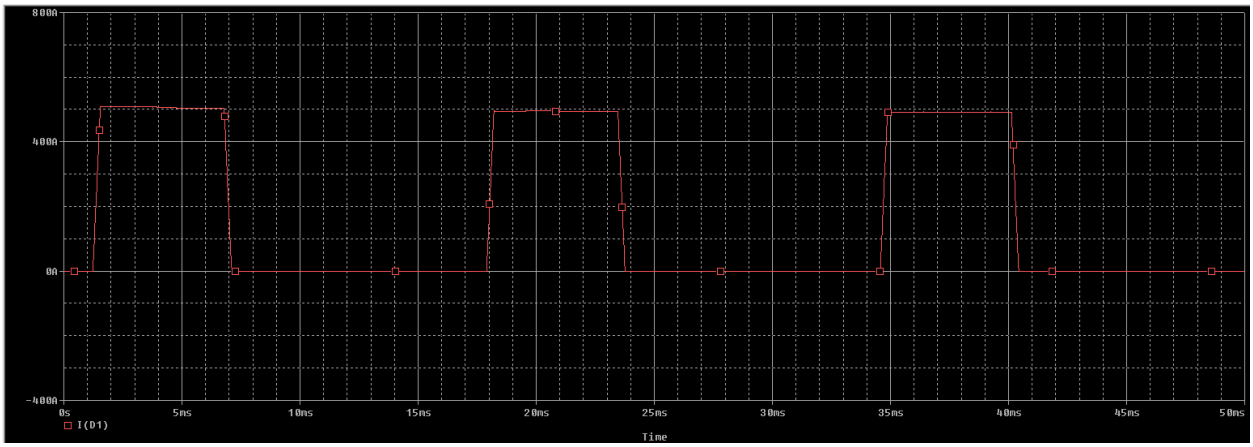


Part B

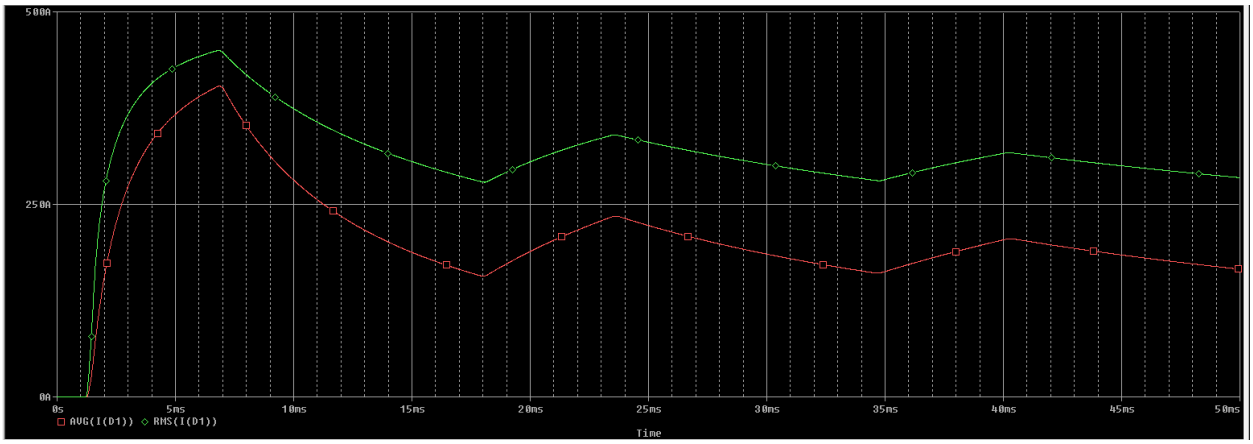
Circuit Diagram PSPICE:



Instantaneous Current Through diode D1

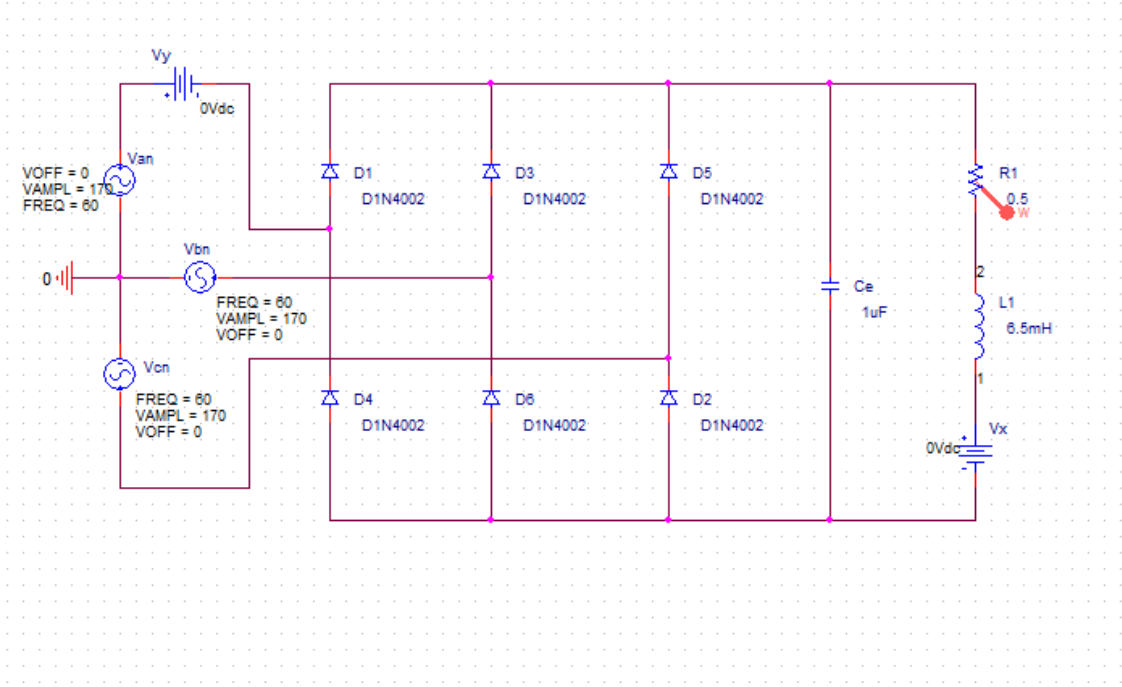


Rms and Average Current through diode (D1)

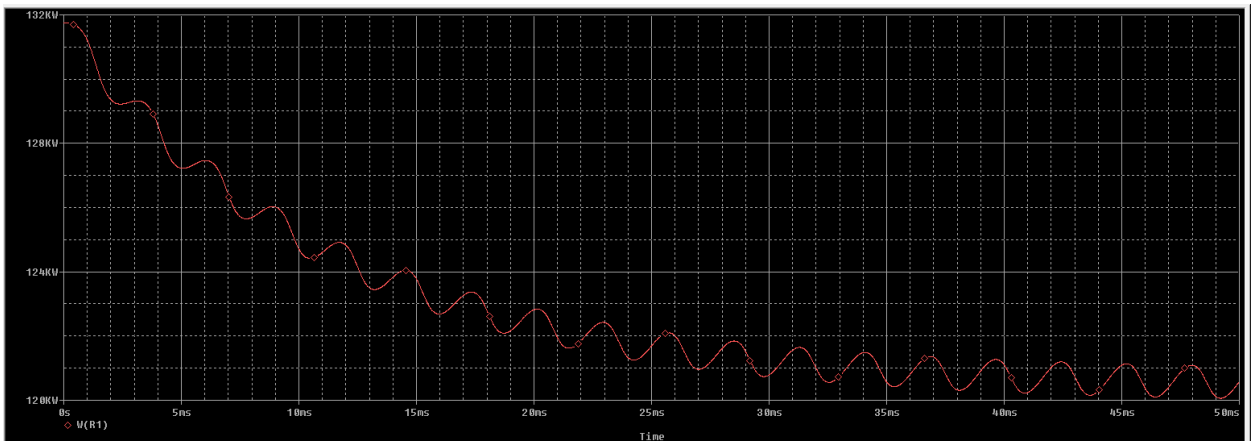

500A
250A
0A
0s
5ms
10ms
15ms
20ms
25ms
30ms
35ms
40ms
45ms
50ms
AVG(I(D1))
RMS(I(D1))
Time

Part C

Circuit Diagram PSPICE:



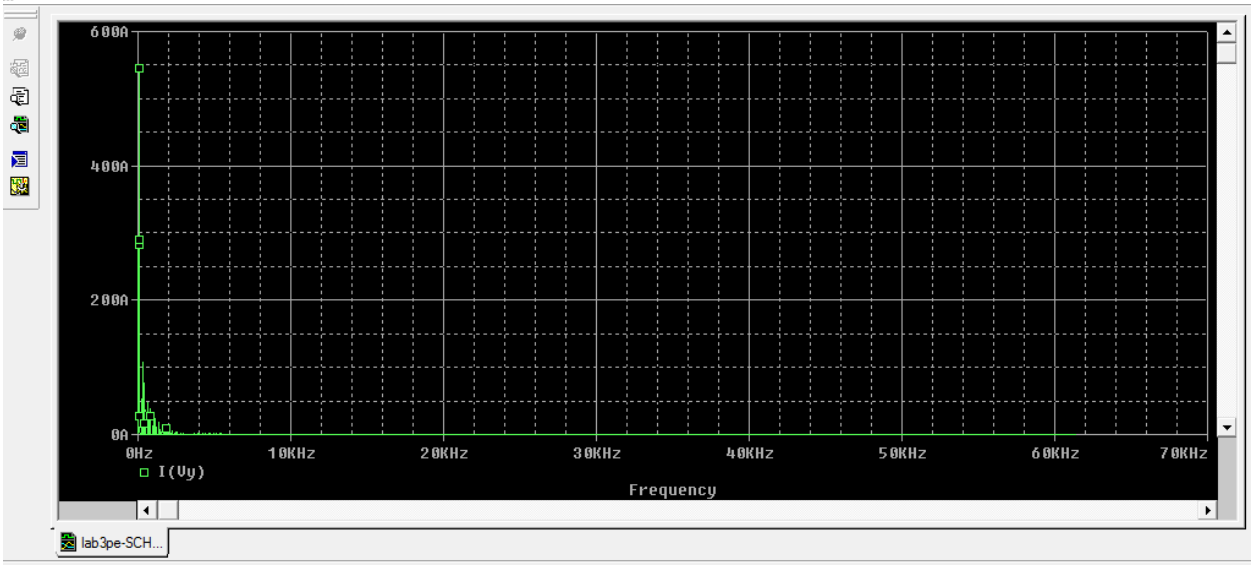
Instantaneous average output power:



Part D

FFT of the input current:

```
FOURIER COMPONENTS OF TRANSIENT RESPONSE I(V_Vy)


 DC COMPONENT =   1.490506E-01

 HARMONIC    FREQUENCY     FOURIER     NORMALIZED     PHASE        NORMALIZED
    NO         (HZ)       COMPONENT    COMPONENT     (DEG)       PHASE (DEG)

     1     6.000E+01     5.415E+02     1.000E+00    -1.236E-02     0.000E+00
     2     1.200E+02     1.255E-01     2.317E-04    -7.605E+01    -7.602E+01
     3     1.800E+02     6.606E-02     1.220E-04    -7.946E+01    -7.942E+01
     4     2.400E+02     6.138E-02     1.133E-04    -9.510E+01    -9.505E+01
     5     3.000E+02     1.069E+02     1.974E-01     1.797E+02     1.798E+02
     6     3.600E+02     1.025E-02     1.892E-05     1.796E+02     1.797E+02
     7     4.200E+02     7.534E+01     1.391E-01    -1.796E+02    -1.795E+02
     8     4.800E+02     2.849E-02     5.260E-05     9.715E+01     9.724E+01
     9     5.400E+02     2.082E-02     3.845E-05     1.089E+02     1.090E+02

     TOTAL HARMONIC DISTORTION =   2.415301E+01 PERCENT

          JOB CONCLUDED

          TOTAL JOB TIME             .28
```



CALCULATIONS:

$I_{IN\ (DC)}$ = 1.49E-1	$I_{1\ (RMS)}$ = 3.813E2
THD (I_{IN}) = 24.15 %	$I_{h\ (RMS)}$ = 0.887E2
ϕ_1 = 0º.	DF = 1
PF =0.97	

CONCLUSION:

In this lab, we learnt about the three phase uncontrolled rectifiers. The circuit of three phase diode rectifier was implemented in PSPICE. The operation of circuit was observed alongwith the calculation of different parameters.