Running hbfree under Windows/ WSL

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All cases ae present at work3 directory of the project

# 1. Case 1 – 1 diode and DC

1. We start with soimplest ciruit at ckt1.cir

Executing   
> ./s ckt1.cir ckt1.hb

It converts spice format to hbree input format

1. Look at it:

&SERV EPSIW=1e-06, KITU=0, EPSSOL=1e-12, EPSDU=1e-09, EPSMIN=1e-06,

MAXDU=100, LIMIT=50, KPRLEN=0, KPRSRT=0, KPRNKR=0,

KPRLIN=0, KPRSOL=0, MGLOB=1, IAPR=0, KNC=32,

NAME='spice test ' /

&CIRCOM /

&TYP IT='R ', KOL=2, P=0. /

&ELEM NE='Rvs ', KNOT=1, 0, PAR=0.001 /

&ELEM NE='Rl ', KNOT=1, 2, PAR=10 /

&TYP IT='VD ', 'SCHT', KOL=1, P=1,0.8 /

&ELEM NE='D1 ', KNOT=2, 0, PAR=1, 0, 0, 1e-09, 0, 38.6676, 0.5, 0.1 /

&TYP IT='J ', KOL=3 /

&ELEM NE='V001', KNOT=1, 0, PAR=0, 0, 0, 400 /

&ELEM NE='V002', KNOT=1, 0, PAR=0, 1e+06, -1.5708, 1000 /

&ELEM NE='V003', KNOT=1, 0, PAR=0, 1.1e+06, -1.5708, 100 /

&TYP IT='END ' /

&FREQU F1=1e+06, F2=1.1e+06, MN=0,0, KN=1 /

&VAR FIN='END ' /

&QUP IQ='END ' /

Explanation:

Section 1 – general constants

Section 2 – circuit

Section 3 – frequencies

Section 4 and 5 – empty

1. Output

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COMMON PARAMETERS OF CKT :

DIELECTRIC PERMITTIVITY OF SUBSTRATE 0.96000E+01

MAGNITE PERMITTIVITY OF CONDUCTORS = 0.10000E+01

SPESIFIC RESISTIVITY OF CONDUCTORS = 0.57000E+08

tg(delta) - LOSSES IN DIELECTRIC = 0.10000E-03

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RESULTS OF Y-MATRICES FORMING

FREQUNCY 0.00000E+00

Y( 1, 1, 1)= 0.90901E-01 0.00000E+00

VECTJ( 1 1)= 0.36360E-01 0.00000E+00

ITERATION 1

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0913

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

ERROR =0.521490E-02, STEP=0.400000E+00, SPEED OF DECREASING=0.152561E-02

ITERATION 2

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0913

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

ERROR =0.997177E-03, STEP=0.178257E-01, SPEED OF DECREASING=0.191573E-03

ITERATION 3

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0913

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

ERROR =0.493636E-04, STEP=0.519050E-02, SPEED OF DECREASING=0.857497E-05

ITERATION 4

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0913

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

IT IS LOCAL MINIMUM :

ITERATION 4

GRADIENT OF ERROR NORM 0.222601E-07(<0.100000E-05)

1/2 SQUARED L-2 ERROR NORM 0.829681E-14

ERROR 0.128816E-06

REQUIRED 0.100000E-11

FREQUNCY 1 COMBINATION( 0, 0) VALUE 0.000000E+00

U( 1)=0.399998E+00 0.000000E+00

U( 2)=0.378817E+00 0.000000E+00

U( 3)=0.376699E+00 0.000000E+00

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1. Header with common parameters
2. Seolution process
3. Node voltages (nodes coinside with circuit)

***NB – circuit will follow***

# 2. Case 2 – same circuit, DC + Large signal

NB (time domain solution and comparison wil follow)

Now lets simulate same circuit under DC and periodic excitation:

&SERV EPSIW=1e-06, KITU=0, EPSSOL=1e-12, EPSDU=1e-09, EPSMIN=1e-06,

MAXDU=100, LIMIT=50, KPRLEN=0, KPRSRT=0, KPRNKR=0,

KPRLIN=0, KPRSOL=0, MGLOB=1, IAPR=0, KNC=32,

NAME='spice test ' /

&CIRCOM /

&TYP IT='R ', KOL=2, P=0. /

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&ELEM NE='D1 ', KNOT=2, 0, PAR=1, 0, 0, 1e-09, 0, 38.6676, 0.5, 0.1

/

&TYP IT='J ', KOL=3 /

&ELEM NE='V001', KNOT=1, 0, PAR=0, 0, 0, 400 /

&ELEM NE='V002', KNOT=1, 0, PAR=0, 1e+06, -1.5708, 1000 /

&ELEM NE='V003', KNOT=1, 0, PAR=0, 1.1e+06, -1.5708, 100 /

&TYP IT='END ' /

&FREQU F1=1e+06, F2=1.1e+06, **MN=0,0, 1,0, 2,0, 3,0, 4,0, KN=5**  /

&VAR FIN='END ' /

&QUP IQ='END ' /

Only difference is highlighted with **BOLD RED**

Output:

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RESULTS OF Y-MATRICES FORMING

FREQUNCY 0.00000E+00

Y( 1, 1, 1)= 0.90901E-01 0.00000E+00

VECTJ( 1 1)= 0.36360E-01 0.00000E+00

FREQUNCY 0.10000E+07

Y( 1, 1, 2)= 0.90901E-01 0.00000E+00

VECTJ( 1 2)=-0.23610E-06 -0.64277E-01

FREQUNCY 0.20000E+07

Y( 1, 1, 3)= 0.90901E-01 0.00000E+00

VECTJ( 1 3)= 0.00000E+00 0.00000E+00

FREQUNCY 0.30000E+07

Y( 1, 1, 4)= 0.90901E-01 0.00000E+00

VECTJ( 1 4)= 0.00000E+00 0.00000E+00

FREQUNCY 0.40000E+07

Y( 1, 1, 5)= 0.90901E-01 0.00000E+00

VECTJ( 1 5)= 0.00000E+00 0.00000E+00

ITERATION 1

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0913

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

ONE-DIM SEARCH :

FNOR=0.615060E+16, LAMBDA=0.100000E+00

ERROR =0.578488E-01, STEP=0.707106E+00, SPEED OF DECREASING=0.105193E-02

ITERATION 2

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=180.0714

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1000000E+01

ONE-DIM SEARCH :

FNOR=0.615063E+16, LAMBDA=0.100000E+00

ERROR =0.519920E-01, STEP=0.636279E+00, SPEED OF DECREASING=0.103445E-02

ITERATION 3

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=170.5653

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1013968E+01

ONE-DIM SEARCH :

FNOR=0.620676E+16, LAMBDA=0.100000E+00

ERROR =0.396395E-01, STEP=0.534690E+00, SPEED OF DECREASING=0.616128E-02

ITERATION 4

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 97.8175

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.7398608E+01

ONE-DIM SEARCH :

FNOR=0.589559E+09, LAMBDA=0.100000E+00

ERROR =0.348045E-01, STEP=0.245006E+00, SPEED OF DECREASING=0.709243E-02

ITERATION 5

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 96.7510

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.8568680E+01

ONE-DIM SEARCH :

FNOR=0.547968E+04, LAMBDA=0.100000E+00

ERROR =0.309512E-01, STEP=0.191222E+00, SPEED OF DECREASING=0.751972E-02

ITERATION 6

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 96.0295

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.9597371E+01

ONE-DIM SEARCH :

FNOR=0.126235E+02, LAMBDA=0.100000E+00

ERROR =0.276254E-01, STEP=0.160579E+00, SPEED OF DECREASING=0.764487E-02

ITERATION 7

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 95.4889

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1054712E+02

ONE-DIM SEARCH :

FNOR=0.157502E+00, LAMBDA=0.100000E+00

ERROR =0.247067E-01, STEP=0.137866E+00, SPEED OF DECREASING=0.756572E-02

ITERATION 8

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 95.0423

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1148715E+02

ONE-DIM SEARCH :

FNOR=0.865954E-02, LAMBDA=0.100000E+00

ERROR =0.221290E-01, STEP=0.120157E+00, SPEED OF DECREASING=0.734926E-02

ITERATION 9

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 94.6735

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1240046E+02

ONE-DIM SEARCH :

FNOR=0.128101E-02, LAMBDA=0.189116E+00

ERROR =0.176616E-01, STEP=0.105870E+00, SPEED OF DECREASING=0.662687E-02

ITERATION 10

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION= 94.0516

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1432164E+02

ERROR =0.996357E-02, STEP=0.835450E-01, SPEED OF DECREASING=0.677965E-02

ITERATION 11

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=122.0508

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.1887666E+01

ERROR =0.152101E-02, STEP=0.402725E-02, SPEED OF DECREASING=0.761161E-03

ITERATION 12

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=112.5232

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.2616855E+01

ERROR =0.857963E-04, STEP=0.122476E-02, SPEED OF DECREASING=0.411710E-04

ITERATION 13

\*\*\* IN THIS POINT ANGLE BTWN GRAD. AND CORRECTION=110.1941

\*\*\* LOWER ESTIM. OF CONDITION NUMBER = 0.2904565E+01

IT IS LOCAL MINIMUM :

ITERATION 13

GRADIENT OF ERROR NORM 0.168167E-06(<0.100000E-05)

1/2 SQUARED L-2 ERROR NORM 0.146798E-12

ERROR 0.357050E-06

REQUIRED 0.100000E-11

FREQUNCY 1 COMBINATION( 0, 0) VALUE 0.000000E+00

U( 1)=0.399962E+00 0.000000E+00

U( 2)=0.173262E-01 0.000000E+00

U( 3)=-.209374E-01 0.000000E+00

FREQUNCY 2 COMBINATION( 0, 1) VALUE 0.100000E+07

U( 1)=-.367305E-05 -.999957E+00

U( 2)=-.210640E-05 -.573249E+00

U( 3)=-.194974E-05 -.530578E+00

FREQUNCY 3 COMBINATION( 0, 2) VALUE 0.200000E+07

U( 1)=0.181251E-04 -.133160E-09

U( 2)=0.181269E+00 -.133174E-05

U( 3)=0.199395E+00 -.146490E-05

FREQUNCY 4 COMBINATION( 0, 3) VALUE 0.300000E+07

U( 1)=0.237469E-11 0.224718E-06

U( 2)=0.237492E-07 0.224740E-02

U( 3)=0.261239E-07 0.247212E-02

FREQUNCY 5 COMBINATION( 0, 4) VALUE 0.400000E+07

U( 1)=0.233479E-05 -.343838E-10

U( 2)=0.233503E-01 -.343872E-06

U( 3)=0.256851E-01 -.378256E-06

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**NB : Results – to be explained**