



1.

```
.define Ai 416
.define m 3
.define Fi 50
.define alf (0)*pi/180
.MODEL 3PHASE1 SIN (F=Fi A=Ai PH=alf)
.MODEL 3PHASE2 SIN (F=Fi A=Ai
    PH=2*pi*2/3+alf)
.MODEL 3PHASE3 SIN (F=Fi A=Ai
    PH=2*pi*1/3+alf)
.define alfr (0-90)*pi/180
.MODEL 3PHASE1r SIN (F=Fi A=Ai PH=alfr)
.MODEL 3PHASE2r SIN (F=Fi A=Ai
    PH=2*pi*2/3+alfr)
.MODEL 3PHASE3r SIN (F=Fi A=Ai
    PH=2*pi*1/3+alfr)
.define zi 15
.define kr 0.25
.define xi zi/sqrt(1+kr**2)
.define Lip xi/(2*pi*Fi)
.define Rip kr*xi
.MODEL Li IND (L=Lip)
.MODEL Ri RES (R=Rip)
```

2.

```
.MODEL MR2510 D
.define TT 5.8267U
.define Cfmin ((4/9)*(TT**2)/(Lip))
.define Rfm sqrt(3)*TT/Cfmin
.define kcf 3
.define krf 2
.define Cf3 kcf*Cfmin
.define Rf3 Rfm/krf
.define Cfp 3*Cf3/m
.define Rfp m*Rf3/3
.MODEL Cf CAP (C=Cfp)
.MODEL Rf RES (R=Rfp)
```

3.

```
.MODEL Rn RES (R=98.475)
.MODEL Ln IND (L=10k)
.define un v(5,3)
.define in i(Rn)
```

4.

```
.define Udo (3*sqrt(3)*Ai/pi)
.define Idk (Ai/Zi)
.define Iik (Ai/(sqrt(2)*Zi))
```

5.

```
.define P1 avg((v(V1)*i(Ri1))+
    (v(V2)*i(Ri2))+v(V3)*i(Ri3)))
.define Q1 avg((v(V1r)*i(Ri1))+
    (v(V2r)*i(Ri2))+v(V3r)*i(Ri3)))
.define S1 sqrt(P1**2+Q1**2)
.define uns avg(un)
.define ins avg(in)
.define Pn1 uns*ins
.define I1 avg(S1/(m*Ai/sqrt(2)))
.define I avg(sqrt((i(Ri1)**2+...+i(Ri3)**2)/3))
.define kis I1/I
.define Rd uns/ins
.define Id ins/Idk
.define Ud uns/Udo
.define ki1 ins/I1
.define I1oe I1/Iik
.define cosfi1 P1/S1
.define sinfi1 Q1/S1
.define xioe xi/zi
.define rioe rip/zi
.define tnfiB
    (sinfi1-I1oe*xioe)/(cosfi1-I1oe*rioe)
.define KPD Pn1/P1
.define ks 1/(cosfi1*kis*KPD)
```

Рис.1