

Appendix A

MATLAB Code for EAF embedded function block

```
function v = fcn(i,s1,s2, Vt)
% This block supports the Embedded MATLAB subset.
% See the help menu for details.

A=40;
B=10;
C=19000;
D=5000;
i0=2e04;
l=39.5;

%Vat=A+B*l;

if (s1==1 || s2==0 && i>0)
    v=sign(i)*(Vt+(C/(D+abs(i)))));
else
    v=Vt*(1-exp(-abs(i)/i0))*sign(i);
end
```

Appendix B

MATLAB Code for Complete Stability Analysis

```
%Complete Stability Analysis
```

```
V=220;  
S=10e03;  
f=50;  
fv=25e03;  
n=25;  
DF=0.6;  
kc=0.2;  
tc=100e-06;  
w=2*pi*f;  
m=100;  
kv=80;  
tv=8e-06;  
Kpwm=200/16;
```

```
Kc=tf([kc],[tc 1]);
```

```
A=tf([1 0 w^2],[1 m w^2]);
```

```
Kv=tf([kv],[tv 1]);
```

```
fcf=fv/10;
```

```
Lf=(n*3*(V^2/S))/(2*pi*fv);
```

```
Cf=1/(((2*pi)^2)*Lf*((fcf)^2));
```

```
Rf=2*DF*(sqrt(Cf/Lf));
```

```
Kf=tf([0 Rf*Lf 0],[Lf*Cf Rf*Lf 1]);
```

```
Ks=Kc*A*Kv*Kf*Kpwm;
```

```
Ls=0.23e-03;
```

```
L5=8.919e-03;
```

```
C5=45.49e-06;
```

```
Q5=40;
```

```
L7=4.551e-03;
```

```
C7=45.49e-06;
```

```
Q7=40;
```

```

L11=1.843e-03;
C11=45.49e-06;
Q11=40;
Lh=7e-03;
Ch=10e-06;
Rh=10;

ZS=0.1+1i*0.23e-03;
RS=real(ZS);
XS=imag(ZS);

Zs=tf([1],[XS RS]);

R5=2*pi*50*5*L5*Q5;
R7=2*pi*50*7*L7*Q7;
R11=2*pi*50*11*L11*Q11;

z5=R5+1i*(2*pi*50*L5-1/(2*pi*50*C5));
z7=R7+1i*(2*pi*50*L7-1/(2*pi*50*C7));
z11=R11+1i*(2*pi*50*L11-1/(2*pi*50*C11));
zh=Rh+1i*(2*pi*50*Lh-1/(2*pi*50*Ch));
ZF=1/((1/z5)+(1/z7)+(1/z11)+(1/zh));
RF=real(ZF);
XF=imag(ZF);
Zf=tf([1],[XF RF]);
kp=(Lf*Cf)/(Rf*Lf);
Kp=tf([kp 1],[1]);
Ksd=Kp*Ks;
G=Ksd/(Zs);
bode(G)

```