APPENDIX A

Program for Determining Equivalent Damping Ratio
(400-m High Building with TMD)

```
%Program 1  Determining equivalent damping ratio (400-m high building with TMD)

%1.1 Input building and TMD properties

clear;
Mk=10;
Ms=1000;
Es=0.010;
Uk=Mk/Ms;
Ws=0.09*2*22/7;
Yk= 1/(1+Uk);
Wk=Ws*Yk;
p=-20*Ws;
Ek=((Uk)^0.5)/2

%1.2 Determine optimal equivalent damping ratio by estiamte procedure

EE1=((Uk)^0.5)/4+0.8*Es

%1.3 Determine optimal equivalent damping ratio by classical procedure

%1.3.1 Determine building-complex-frequency-displcaement
% from equation of motion

j=0;
for p=-20*Ws:0.01*Ws:20*Ws,
A1=(1)*(-(p^2))+2*Es*Ws*(p*i)+Ws^2;
B1=-(Uk*(Wk^2+2*Ek*Wk*(p*i)));
A2=-p^2;
B2=((-(p^2))+(p*2*Ek*Wk)*i+Wk^2);
D1=A1*B2-A2*B1;
H=B2*Ws^2/D1;
HTMD=-A2*Ws^2/D1;
```

```
DMF=(abs(H))^2;
DMFTMD=(abs(HTMD))^2;

j=j+1;
s(j)=DMF;
a(j)=DMFTMD;
end

l=(-20:0.01:20);

%1.3.2 Plot building-complex-frequency-displcaement with frequency p/Ws

plot(l,s,'-',l,a)
xlabel('W/w ratio')
ylabel('Displacement (m)')

%1.3.3 Determine optimal equivalent damping rato base-on area under the
      %graph

EE=3.1416/(2*(trapz(l,s)))
```