APPENDIX C

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

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%Program 3  Determining equivalent damping ratio (400-m high building with ATMD)

%3.1 Input building and ATMD properties

Uk=0.03;
U0=-0.02;
Ws=0.09*3.1416*2;
Es=0.010;
G=(Uk^2*U0)/(1+Uk)^2;
H=(Uk^3*(3*Uk+4))/(4*(1+Uk)^3);
E=Ws*(G+H)^0.5;
Y=Ws^2*(Uk^2+2*Uk+2*U0+2*Uk*U0)/(2*(Uk+1)^2);
Ek=((Uk)^0.5)/2;
Yk= 1/(1+Uk)
ck=2*Ek
ck1=E/Ws-ck
Y1=Y-Yk

%3.2 Determine optimal equivalent damping ratio by classical procedure

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

j=0;
for p=-20*Ws:0.01*Ws:20*Ws,
A1=(1+Uk)*(-(p^2))+2*Es*Ws*(p*i)+Ws^2;
B1=-(Uk*p^2);
A2=-Uk*p^2;
B2=((-(p^2))*(Uk+U0)+(p*E)*i+Y);
D1=A1*B2-A2*B1;
H=B2*Ws^2/D1;
DMF=(abs(H));
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j=j+1;
s(j)=DMF^2;

end

l=(-20:0.01:20);

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

plot(l,s)
xlabel('W/Ws ratio')
ylabel('Complex frequency response (m)')

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

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