CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Based on the discussion on the results of the analysis and experiments, it can some conclusions are drawn like this :

1. Table 5.1. specified that the difference between acceleration data and acceleration sensor data falls at approximately 10%, from floor 1 and 2. With that it can be conclucted that it is fairly significant.

Table 5.1. table difference between acceleration data and acceleration sensor.

Data	Floor	Non TLD	TLD	Differences %
Displacement (m)	1	0.2270	0.2102	7.4%
Displacement (m)	2	0.3822	0.3511	8.1%
Velocity (m/s)	1	2.0592	0.7174	65.2%
Velocity (m/s)	2	3.3820	1.8998	43.8%
Acceleration (m/s^2)	1	25.4971	22.0436	13.5%
Acceleration (m/s^2)	2	38.6005	35.2546	8.7%
Acceleration Sensor (m/s^2)	1	5.3648	4.7421	11.6%
Acceleration Sensor (m/s^2)	2	5.863	5.0583	13.7%

2. The results from the findings of this study shows that displacement difference Matlab model has 7.4% at first floor and 8.1% at second floor. Also the result for displacement experimental has 18.75% at first floor and 13.63% at second floor. Therefore it can be concluded between these two methods of displacement it has a significant decreasement in it’s values.

5.2 RECOMMENDATION

Based on the conclusions and discussion on experimental and numerical models, the authors suggest several important points, specifically:

1. More type of sensor such as displacement sensor and velocity sensor can be used to compare more data.
2. Several dimensions of tuned liquid damper can be compared to get more complete result.

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APPENDIX INPUT AND OUTPUT

SHEAR STRUCTURE

```
 clear all

n1=coor(0,0);
n2=coor(0.30,0);
n3=coor(0,0.4);
n4=coor(0.30,0.4);
n5=coor(0,0.8);
n6=coor(0.30,0.8);

L=0.20%L
g=9.81 %g


E= 2e8  % kN/m^2
Aa=2*0.003*0.018%m2s
Ab=2*0.018*0.003
mbar= 0.2826 %kg/m' %7850 kg/m3*A
Ia=1/12*0.003*0.018^3
Ib=1/12*0.018*0.003^3

A1=Aa;
I1=Ia;
[L1,T1]=memf(n3,n4);
k1=klf(E,A1,I1,L1);
K1=kg(k1,T1);
ID1=[9 1 2 9 3 4];
```

```
A2=Aa;
I2=Ia;
[L2,T2]=memf(n5,n6);
k2=klf(E,A2,I2,L2);
K2=kg(k2,T2);
ID2=[10 5 6 10 7 8];

A3=Ab;
I3=Ib;
[L3,T3]=memf(n1,n3);
k3=klf(E,A3,I3,L3);
K3=kg(k3,T3);
ID3=[ 0 0 0 9 1 2];

A4=Ab;
I4=Ib;
[L4,T4]=memf(n2,n4);
k4=klf(E,A4,I4,L4);
K4=kg(k3,T3);
ID4=[0 0 0 9 3 4];

A5=Ab;
I5=Ib;
[L5,T5]=memf(n3,n5);
```

```
k5=klf(E,A5,I5,L5);
K5=kg(k5,T5);
ID5=[9 1 2 10 5 6];

A6=Ab;
I6=Ib;
[L6,T6]=memf(n4,n6);
k6=klf(E,A6,I6,L6);
K6=kg(k6,T6);
ID6=[9 3 4 10 7 8];

dof=10;
K=assf(K1,ID1,dof);
K=K+assf(K2,ID2,dof);
K=K+assf(K3,ID3,dof);
K=K+assf(K4,ID4,dof);
K=K+assf(K5,ID5,dof);
K=K+assf(K6,ID6,dof);

Klat=kcon (K,8,2)

M=[0.012 0; 0 0.012]
[eigv,eigval]=eig(M\Klat)

[n1,n2]=size(M);
n=n1;

[wo,worder]=sort(sqrt(diag(eigval)))
mode=eigv(:,worder)

modeshape(:,1)=mode(:,1)/abs(mode(n,1))
modeshape(:,2)=mode(:,2)/abs(mode(n,2))

T1=2*pi/wo(1)

psil1=0.05;
ak=2*psil1/wo(1)
C=ak*Klat
```

```
%TMD%
mode1=modeshape(:,1)
mu=0.04    %tetukan massa  TMD misal 4%
M1=mode1'*M*mode1
md=mu*M1
alpha=1/(1+mu)
wd=alpha*wo(1)
kd=md*wd^2
psid=sqrt(0.01/(L^(3/2)*sqrt(g)))
cd=2*md*wd*psid


Kd=[kd -kd;-kd kd]
Cd=[cd -cd;-cd cd]

dof=3
IDd=[2 3]
IDlat=[1 2]
Ks=assg(Klat,IDlat,dof,2)
Ks=Ks+assg(Kd,IDd,dof,2)    %K stuktur + TMD

Cs=assg(C,IDlat,dof,2)
Cs=Cs+assg(Cd,IDd,dof,2)    %C stuktur + TMD
Ms=[0.012 0 0;0 0.012 0;0 0 md]
%TMD%

eo=[-0.05;-0.05];
A= [zeros(n,n) eye(n); -inv(M)*Klat -inv(M)*C ]
E=[zeros(n,1); inv(M)*eo]

N=2*n
Cy=eye(N)
Dy=zeros(N,1)
```

```
%TMD%
eod=[-0.05;-0.05;-md];
[nd,nd]=size(Ms)
Nd=2*nd

Ad= [zeros(nd,nd) eye(nd); -inv(Ms)*Ks -inv(Ms)*Cs ]
Ed=[zeros(nd,1); inv(Ms)*eod]

Cyd=eye(Nd)
Dyd=zeros(Nd,1)

systd=ss(Ad,Ed,Cyd,Dyd);%TMD
%TMD%

load elctr.dat
t=elctr(:,1);
iul=9.81*elctr(:,2);

sys1=ss(A,E,Cy,Dy);

[y1,t1,z1]=lsim(sys1,iul,t);
[y1,t1,zd]=lsim(systd,iul,t);

a=-inv(M)*[Klat C]*z1';
ad=-inv(Ms)*[Ks Cs]*zd';

subplot 211
plot (t,a(1,:),'k',t,ad(1,:),'r-.') %percepatan
legend('first floor acceleration','first floor acceleration TLD')
```

```
xlabel('Times (s)');
ylabel('Acceleration (m/s2)');
subplot 212
plot (t,a(2,:),'k',t,ad(2,:),'r-.') %percepatan
legend('top floor acceleration','top floor acceleration TLD')
xlabel('Times (s)');
ylabel('Acceleration (m/s2)');
```

```
pause
subplot 211
plot (t,z1(:,1),'k',t,zd(:,1),'r-.') %percepatan
legend('first floor displacement','first floor displacement TLD')
xlabel('Times (s)');
ylabel('Displacement (m)');
subplot 212
plot (t,z1(:,2),'k',t,zd(:,2),'r-.') %percepatan
legend('top floor displacement','top floor displacement TLD')
xlabel('Times (s)');
ylabel('Displacement (m)');

pause
subplot 211
plot (t,z1(:,3),'k',t,zd(:,3),'r-.') %percepatan
legend('first floor velocity','first floor velocity TLD')
xlabel('Times (s)');
ylabel('Velocity (m/s)');

subplot 212
plot (t,z1(:,4),'k',t,zd(:,4),'r-.') %percepatan
legend('top floor velocity','top floor velocity TLD')
xlabel('Times (s)');
ylabel('Velocity (m/s)');

Acc1=a(1,:);
Acc2=a(2,:);
Acc3=ad(1,:);
Acc4=ad(2,:);

vel1=z1(:,3);
vel2=z1(:,4);
vel3=zd(:,3);
vel4=zd(:,4);

dis1=z1(:,1);
dis2=z1(:,2);
dis3=zd(:,1);
dis4=zd(:,2);

Periode1=(2*pi())/wo(1,1)
PeriodeTLD=(2*pi())/wd
```

```
h=(L/pi())*atanh(L*(wd^2)/(g*pi))
B=md/(L*h)

f1=1/(2*pi()/wo(1,1))

f2=1/(2*pi()/wo(2,1))

a1max=max(abs(Acc1))
a2max=max(abs(Acc2))
a1TLDmax=max(abs(Acc3))
a2TLDmax=max(abs(Acc4))

v1max=max(abs(vel1))
v2max=max(abs(vel2))
v1TLDmax=max(abs(vel3))
v2TLDmax=max(abs(vel4))

d1max=max(abs(dis1))
d2max=max(abs(dis2))
d1TLDmax=max(abs(dis3))
d2TLDmax=max(abs(dis4))
%Az=a;
%phi=modeshape;
%zeta=[0.005 0.005];
%wn=[wo(1,1) wo(2,1)];
%t1=t';
%save ('frame_1.mat', 'Az', 'phi', 't1', 'zeta', 'wn')
```