BAB V

PENUTUP

5.1. Kesimpulan

Dari analisis yang telah dilakukan dapat disimpulkan beberapa hal sebagai berikut ini.

1. Perbedaan letak aktuator memberi pengaruh terhadap nilai gaya kontrol yang dihasilkan dan respon struktur yang terjadi.
2. Untuk portal A :
   a. aktuator di lantai dasar memberi pengurangan respon yang paling kecil dengan menggunakan gaya kontrol yang paling besar,
   b. aktuator di lantai-4 (empat) memberi pengurangan respon yang lebih besar dibanding akibat letak aktuator di lantai dasar dengan menggunakan gaya kontrol yang lebih kecil dibanding akibat letak aktuator di lantai dasar,
   c. aktuator di lantai-8 (delapan) memberi pengurangan respon yang paling besar dengan menggunakan gaya kontrol yang paling kecil.
3. Untuk portal B :
   a. aktuator di lantai dasar memberi pengurangan respon yang paling kecil dengan menggunakan gaya kontrol yang paling besar,
   b. aktuator di lantai-5 (lima) memberi pengurangan respon yang lebih besar dibanding akibat letak aktuator di lantai dasar dengan menggunakan gaya kontrol yang lebih kecil dibanding akibat letak aktuator di lantai dasar,

c. aktuator di lantai-10 (sepuluh) memberi pengurangan respon yang paling besar dengan menggunakan gaya kontrol yang paling kecil.

4. Dengan pengertian efektif adalah penerapan kontrol aktif yang menghasilkan pengurangan respon struktur yang maksimal dengan gaya kontrol yang minimal, dari analisis ini dapat disimpulkan bahwa letak aktuator di lantai paling atas adalah letak aktuator yang paling efektif.

5.2. Saran

Dari analisis yang telah dilakukan diperoleh beberapa hal yang perlu menjadi perhatian yakni :

1. pemahaman menyeluruh akan konsep kontrol aktif sangat diperlukan untuk memperlancar pelaksanaan analisis,
2. pemilihan standar perbandingan yang tepat akan mempermudah proses pengambilan kesimpulan.

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LAMPIRAN

Listing program Matlab

Untuk mensimulasi respon portal A tanpa gaya kontrol

```
O=zeros(8);
I=eye(8);
M=345.6*I;
K=1E5* [ 6.808  -3.404      0      0      0      0      0      0
        -3.404   6.808  -3.404      0      0      0      0      0
             0  -3.404   6.808  -3.404      0      0      0      0
             0       0  -3.404   6.808  -3.404      0      0      0
             0       0       0  -3.404   6.808  -3.404      0      0
             0       0       0      0  -3.404   6.808  -3.404      0
             0       0       0      0      0  -3.404   6.808  -3.404
             0       0       0      0      0      0  -3.404   3.404];

C=1E3* [5.874  -2.937      0      0      0      0      0      0
        -2.937   5.874  -2.937      0      0      0      0      0
             0  -2.937   5.874  -2.937      0      0      0      0
             0       0  -2.937   5.874  -2.937      0      0      0
             0       0       0  -2.937   5.874  -2.937      0      0
             0       0       0      0  -2.937   5.874  -2.937      0
             0       0       0      0      0  -2.937   5.874  -2.937
             0       0       0      0      0      0  -2.937   2.937];


A=[  O                I
     -inv(M)*K  -inv(M)*C];
B=[0;0;0;0;0;0;0;0;1/345.6;0;0;0;0;0;0;0];
c=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
D=[0];
Ez=-[0;0;0;0;0;0;0;0;1;1;1;1;1;1;1;1];
sys1=ss(A,Ez,c,D);


load C:\matlabR11\work\elcentro2.m
t=elcentro2(:,1);
iu=elcentro2(:,2);
[y,t,x]=lsim(sys1,iu,t);
a=max(abs(x));
b=a(:,1:8);
```

Listing program Matlab

Untuk mensimulasi respon portal A dengan aktuator terletak di lantai dasar

```
O=zeros(8);
I=eye(8);
M=345.6*I;
K=1E5* [ 6.808  -3.404      0      0      0      0      0      0
        -3.404   6.808  -3.404      0      0      0      0      0
             0  -3.404   6.808  -3.404      0      0      0      0
             0       0  -3.404   6.808  -3.404      0      0      0
             0       0       0  -3.404   6.808  -3.404      0      0
             0       0       0      0  -3.404   6.808  -3.404      0
             0       0       0      0      0  -3.404   6.808  -3.404
             0       0       0      0      0      0  -3.404   3.404];

C=1E3* [5.874  -2.937      0      0      0      0      0      0
        -2.937   5.874  -2.937      0      0      0      0      0
             0  -2.937   5.874  -2.937      0      0      0      0
             0       0  -2.937   5.874  -2.937      0      0      0
             0       0       0  -2.937   5.874  -2.937      0      0
             0       0       0      0  -2.937   5.874  -2.937      0
             0       0       0      0      0  -2.937   5.874  -2.937
             0       0       0      0      0      0  -2.937   2.937];


A=[  O                  I
     -inv(M)*K  -inv(M)*C];
B=[0;0;0;0;0;0;0;0;1/345.6;0;0;0;0;0;0;0];
c=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
D=[0];
Ez=-[0;0;0;0;0;0;0;0;1;1;1;1;1;1;1;1];


q=[1E5; 1E3; 1E2; 1E6; 1E4; 1E3; 1E5; 5E9; 1E7; 1E4; 1E3; 1E4; 1E2; 1E5;1E4; 1E3];
Q=diag(q);
R=1;
[k,s,e]=lqr(A,B,Q,R)
Acl=(A-B*k);
sys2=ss(Acl,Ez,c,D);


load C:\matlabR11\work\elcentro2.m
t=elcentro2(:,1);
iu=elcentro2(:,2);
[y2,t,x2]=lsim(sys2,iu,t);
uc=-k*x2';
f=max(abs(uc));
g=max(abs(x2));
h=g(:,1:8)
```

Listing program Matlab

Untuk mensimulasi respon portal B tanpa gaya kontrol

```
O=zeros(10);
I=eye(10);
M=357.24*I;
K=1E5*[13.0996 -6.5498      0      0      0      0      0      0      0      0
       -6.5498 13.0996 -6.5498      0      0      0      0      0      0      0
             0 -6.5498 13.0996 -6.5498      0      0      0      0      0      0
             0      0 -6.5498 13.0996 -6.5498      0      0      0      0      0
             0      0      0 -6.5498 13.0996 -6.5498      0      0      0      0
             0      0      0      0 -6.5498 13.0996 -6.5498      0      0      0
             0      0      0      0      0 -6.5498 13.0996 -6.5498      0      0
             0      0      0      0      0      0 -6.5498 13.0996 -6.5498      0
             0      0      0      0      0      0      0 -6.5498 13.0996 -6.5498
             0      0      0      0      0      0      0      0 -6.5498 6.5498];

C=1E3*[ 12.30  -6.15      0      0      0      0      0      0      0      0
        -6.15  12.30  -6.15      0      0      0      0      0      0      0
            0  -6.15  12.30  -6.15      0      0      0      0      0      0
            0      0  -6.15  12.30  -6.15      0      0      0      0      0
            0      0      0  -6.15  12.30  -6.15      0      0      0      0
            0      0      0      0  -6.15  12.30  -6.15      0      0      0
            0      0      0      0      0  -6.15  12.30  -6.15      0      0
            0      0      0      0      0      0  -6.15  12.30  -6.15      0
            0      0      0      0      0      0      0  -6.15  12.30  -6.15
            0      0      0      0      0      0      0      0  -6.15   6.15];


A=[  O              I
   -inv(M)*K  -inv(M)*C];
B=[0;0;0;0;0;0;0;0;0;0;1/357.24;0;0;0;0;0;0;0;0;0];
c=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
D=[0];
Ez=-[0;0;0;0;0;0;0;0;0;0;1;1;1;1;1;1;1;1;1;1];
sys1=ss(A,Ez,c,D);


load C:\matlabR11\work\elcentro2.m
t=elcentro2(:,1);
iu=elcentro2(:,2);
[y,t,x]=lsim(sys1,iu,t);
a=max(abs(x));
b=a(:,1:10)
```

Listing program Matlab

Untuk mensimulasi respon portal B dengan aktuator terletak di lantai dasar

```
O=zeros(10);
I=eye(10);
M=357.24*I;
K=1E5*[13.0996 -6.5498      0      0      0      0      0      0      0      0
       -6.5498 13.0996 -6.5498      0      0      0      0      0      0      0
             0 -6.5498 13.0996 -6.5498      0      0      0      0      0      0
             0      0 -6.5498 13.0996 -6.5498      0      0      0      0      0
             0      0      0 -6.5498 13.0996 -6.5498      0      0      0      0
             0      0      0      0 -6.5498 13.0996 -6.5498      0      0      0
             0      0      0      0      0 -6.5498 13.0996 -6.5498      0      0
             0      0      0      0      0      0 -6.5498 13.0996 -6.5498      0
             0      0      0      0      0      0      0 -6.5498 13.0996 -6.5498
             0      0      0      0      0      0      0      0 -6.5498 6.5498];

C=1E3*[ 12.30   -6.15      0      0      0      0      0      0      0      0
        -6.15   12.30   -6.15      0      0      0      0      0      0      0
             0   -6.15   12.30   -6.15      0      0      0      0      0      0
             0      0   -6.15   12.30   -6.15      0      0      0      0      0
             0      0      0   -6.15   12.30   -6.15      0      0      0      0
             0      0      0      0   -6.15   12.30   -6.15      0      0      0
             0      0      0      0      0   -6.15   12.30   -6.15      0      0
             0      0      0      0      0      0   -6.15   12.30   -6.15      0
             0      0      0      0      0      0      0   -6.15   12.30   -6.15
             0      0      0      0      0      0      0      0   -6.15   6.15];


A=[  O              I
   -inv(M)*K  -inv(M)*C];
B=[0;0;0;0;0;0;0;0;0;0;1/357.24;0;0;0;0;0;0;0;0;0];
c=[1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
D=[0];
Ez=-[0;0;0;0;0;0;0;0;0;0;1;1;1;1;1;1;1;1;1;1];


q=[1E5; 1E3; 1E2; 1E6; 1E4; 1E3; 1E5; 1E10; 1E7; 1E4; 1E3; 1E4; 1E2; 1E5; 1E4; 1E3; 1E4;
1E6; 1E2; 1E5];
Q=diag(q);
R=1;
[k,s,e]=lqr(A,B,Q,R)
Acl=(A-B*k);
sys2=ss(Acl,Ez,c,D);


load C:\matlabR11\work\elcentro2.m
t=elcentro2(:,1);
iu=elcentro2(:,2);
[y2,t,x2]=lsim(sys2,iu,t);
uc=-k*x2';
f=max(abs(uc));
g=max(abs(x2));
h=g(:,1:10);
```