

BAB V

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Setelah melakukan analisis untuk mendeteksi kerusakan pada portal bidang, dapat diambil beberapa kesimpulan:

1. Metode VBPLK dapat digunakan untuk mendeteksi kerusakan pada suatu portal bidang.
2. Normalisasi tegangan maksimum (SRSS) dan normalisasi momen (SRSS) memberikan indikasi yang baik terhadap kerusakan struktur.
3. Pada kasus kerusakan 1 dengan penggunaan 3 buah sensor deteksi kerusakan dapat dilakukan. Batang dianggap rusak memiliki tegangan normalisasi yang paling kecil.
4. Pada kasus kerusakan 2 dan kerusakan 3, tidak dapat dilakukan deteksi kerusakan struktur, hal ini dikarenakan penggunaan 1 buah sensor dan 2 buah sensor tidak mampu memberikan informasi yang baik terhadap batang yang dianggap rusak. Dengan kata lain, penggunaan 1 buah sensor tidak dapat mendeteksi kerusakan struktur.
5. Semakin banyak jumlah sensor akan memberikan hasil deteksi yang lebih baik, hal ini ditunjukkan pada kasus kerusakan 4 dan kasus kerusakan 5.
6. Metode deteksi kerusakan struktur dengan VBPLK dapat digunakan untuk mendeteksi semua elemen struktur, baik itu kolom ataupun balok pada portal bidang.

7. Perhitungan dengan analisis VBPLK mampu memberikan informasi yang benar, hal ini terbukti dengan sama besarnya nilai gaya batang yang dihitung dengan analisis VBPLK ataupun yang didapatkan dari analisis *software* ETABS.

5.2 Saran

Saran-saran yang dapat diberikan penulis dari hasil Tugas Akhir yang disusun tercantum seperti di bawah ini.

1. Perlu dicoba metode VBPLK dengan lebih banyak variasi sensor dan juga dilakukan terhadap gedung yang lebih kompleks.
2. Perlu dicari metode normalisasi tegangan yang lain, sehingga mampu memberikan perbedaan yang signifikan antara batang yang rusak dan batang lain yang tidak rusak.

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Lampiran 1: Coding Matlab Menghitung F_U Kasus Kerusakan 1

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n2=coor(10,0);
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n8=coor(28,4.5);
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n25=coor(0,22.5);
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n27=coor(18,22.5);
n28=coor(28,22.5);

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[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
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[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
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A23=0.0266;
I23=3.064e-3;
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A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
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I29=3.465e-4;
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I30=3.064e-3;
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I31=1.486e-3;
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A35=0.0192;
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A37=0.018;
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A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
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k27=k1f(E,A27,I27,L27);
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k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
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k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
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K3=kg(k3,T3);
K4=kg(k4,T4);
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K40=kg(k40,T40);
K41=kg(k41,T41);
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k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);

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ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
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Ks=Ks+assf(K3, ID3, dof);
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Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
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Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);
Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
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m40=mlf(rhob*A40, L40);
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m42=mlf(rhob*A42, L42);

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M3=kg(m3, T3);
M4=kg(m4, T4);
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M41=kg(m41, T41);
M42=kg(m42, T42);

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Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
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Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(22, i); mode(46, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fu=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'

```

Lampiran 2: Coding Matlab Menghitungan F_D Kasus Kerusakan 1

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192*0.5; %damage member%
I31=(1.486e-3)*0.5; %damage member%
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);

```

```

dof = 72;

ID1=[1 2 3 4 5 6];
ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);

Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);
Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);

m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);

m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);

m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);

m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);

M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);

M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);

M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);

M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);

M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);

Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);

Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);

Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);

Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks)
[w, worder]=sort(sqrt(diag(eigval)))
mode=eigv(:,worder)

i=1:72;
pim=[mode(22, i); mode(46, i); mode(70, i)]
v=sqrtm(mode'*Mr*mode)
wm=diag(w(1:72))
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'

```


Lampiran 3: *Coding* Matlab Menghitung SVD Kasus Kerusakan 1

```
Fd=1e-3*[0.0310 0.0383  
0.0387  
0.0383 0.0851 0.0909  
0.0387 0.0909  
0.1428];  
  
Fu =1. e-3 *[0.0310 0.0382  
0.0388  
0.0382 0.0843 0.0904  
0.0388 0.0904  
0.1422];  
  
Fde1=Fu-Fd  
[u, s, v]=svd(Fde1)
```



Lampiran 4: Coding Matlab Menghitung Gaya Batang Kasus Kerusakan 1

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);
M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);

M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(22, i); mode(46, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v));

```

```

R=zeros(72,1);
R(22,1)=0.8831;
R(46,1)=-0.3048;
R(70,1)= 0.3566;

U=so1v(Ks,R);

u1=dissf(U,ID1,T1);
u2=dissf(U,ID2,T2);
u3=dissf(U,ID3,T3);
u4=dissf(U,ID4,T4);
u5=dissf(U,ID5,T5);
u6=dissf(U,ID6,T6);
u7=dissf(U,ID7,T7);
u8=dissf(U,ID8,T8);
u9=dissf(U,ID9,T9);
u10=dissf(U,ID10,T10);
u11=dissf(U,ID11,T11);
u12=dissf(U,ID12,T12);
u13=dissf(U,ID13,T13);
u14=dissf(U,ID14,T14);
u15=dissf(U,ID15,T15);
u16=dissf(U,ID16,T16);
u17=dissf(U,ID17,T17);
u18=dissf(U,ID18,T18);
u19=dissf(U,ID19,T19);
u20=dissf(U,ID20,T20);
u21=dissf(U,ID21,T21);
u22=dissf(U,ID22,T22);
u23=dissf(U,ID23,T23);
u24=dissf(U,ID24,T24);
u25=dissf(U,ID25,T25);
u26=dissf(U,ID26,T26);
u27=dissf(U,ID27,T27);
u28=dissf(U,ID28,T28);
u29=dissf(U,ID29,T29);
u30=dissf(U,ID30,T30);
u31=dissf(U,ID31,T31);
u32=dissf(U,ID32,T32);
u33=dissf(U,ID33,T33);
u34=dissf(U,ID34,T34);
u35=dissf(U,ID35,T35);
u36=dissf(U,ID36,T36);
u37=dissf(U,ID37,T37);
u38=dissf(U,ID38,T38);
u39=dissf(U,ID39,T39);
u40=dissf(U,ID40,T40);
u41=dissf(U,ID41,T41);
u42=dissf(U,ID42,T42);

So1=zeros(6,1);
So2=zeros(6,1);
So3=zeros(6,1);
So4=zeros(6,1);
So5=zeros(6,1);
So6=zeros(6,1);
So7=zeros(6,1);
So8=zeros(6,1);
So9=zeros(6,1);
So10=zeros(6,1);
So11=zeros(6,1);
So12=zeros(6,1);
So13=zeros(6,1);
So14=zeros(6,1);
So15=zeros(6,1);
So16=zeros(6,1);
So17=zeros(6,1);
So18=zeros(6,1);
So19=zeros(6,1);
So20=zeros(6,1);
So21=zeros(6,1);
So22=zeros(6,1);
So23=zeros(6,1);
So24=zeros(6,1);
So25=zeros(6,1);
So26=zeros(6,1);
So27=zeros(6,1);
So28=zeros(6,1);
So29=zeros(6,1);
So30=zeros(6,1);
So31=zeros(6,1);
So32=zeros(6,1);

So33=zeros(6,1);
So34=zeros(6,1);
So35=zeros(6,1);
So36=zeros(6,1);
So37=zeros(6,1);
So38=zeros(6,1);
So39=zeros(6,1);
So40=zeros(6,1);
So41=zeros(6,1);
So42=zeros(6,1);

S1=stref(k1,u1,So1)
S2=stref(k2,u2,So2)
S3=stref(k3,u3,So3)
S4=stref(k4,u4,So4)
S5=stref(k5,u5,So5)
S6=stref(k6,u6,So6)
S7=stref(k7,u7,So7)
S8=stref(k8,u8,So8)
S9=stref(k9,u9,So9)
S10=stref(k10,u10,So10)
S11=stref(k11,u11,So11)
S12=stref(k12,u12,So12)
S13=stref(k13,u13,So13)
S14=stref(k14,u14,So14)
S15=stref(k15,u15,So15)
S16=stref(k16,u16,So16)
S17=stref(k17,u17,So17)
S18=stref(k18,u18,So18)
S19=stref(k19,u19,So19)
S20=stref(k20,u20,So20)
S21=stref(k21,u21,So21)
S22=stref(k22,u22,So22)
S23=stref(k23,u23,So23)
S24=stref(k24,u24,So24)
S25=stref(k25,u25,So25)
S26=stref(k26,u26,So26)
S27=stref(k27,u27,So27)
S28=stref(k28,u28,So28)
S29=stref(k29,u29,So29)
S30=stref(k30,u30,So30)
S31=stref(k31,u31,So31)
S32=stref(k32,u32,So32)
S33=stref(k33,u33,So33)
S34=stref(k34,u34,So34)
S35=stref(k35,u35,So35)
S36=stref(k36,u36,So36)
S37=stref(k37,u37,So37)
S38=stref(k38,u38,So38)
S39=stref(k39,u39,So39)
S40=stref(k40,u40,So40)
S41=stref(k41,u41,So41)
S42=stref(k42,u42,So42)

```

Lampiran 5: *Output* Gaya Masing-Masing dari *software* Matlab pada Kasus Kerusakan 1

| | | | |
|---------|---------|---------|---------|
| S1 = | S7 = | S13 = | S19 = |
| -0.1001 | -0.0225 | -0.0034 | -0.2604 |
| -0.0765 | -0.0330 | -0.0369 | 0.3208 |
| -0.4373 | -0.1904 | -0.2097 | 1.2574 |
| 0.1001 | 0.0225 | 0.0034 | 0.2604 |
| 0.0765 | 0.0330 | 0.0369 | -0.3208 |
| -0.3280 | -0.1392 | -0.1592 | 0.1860 |
| S2 = | S8 = | S14 = | S20 = |
| -0.0918 | -0.0565 | 0.0058 | 0.0219 |
| -0.0698 | -0.0302 | -0.0379 | 0.1592 |
| -0.2789 | -0.1206 | -0.1511 | 0.4027 |
| 0.0918 | 0.0565 | -0.0058 | -0.0219 |
| 0.0698 | 0.0302 | 0.0379 | -0.1592 |
| -0.2793 | -0.1211 | -0.1523 | 0.3135 |
| S3 = | S9 = | S15 = | S21 = |
| -0.0780 | -0.0878 | 0.0174 | -0.0283 |
| -0.0837 | -0.0225 | -0.0428 | 0.1628 |
| -0.3522 | -0.1046 | -0.1795 | 0.4111 |
| 0.0780 | 0.0878 | -0.0174 | 0.0283 |
| 0.0837 | 0.0225 | 0.0428 | -0.1628 |
| -0.4851 | -0.1202 | -0.2481 | 0.3216 |
| S4 = | S10 = | S16 = | S22 = |
| -0.2123 | 0.0907 | -0.0732 | 0.2668 |
| -0.0584 | -0.0294 | -0.0262 | 0.2921 |
| -0.3365 | -0.1663 | -0.1587 | 1.2627 |
| 0.2123 | -0.0907 | 0.0732 | -0.2668 |
| 0.0584 | 0.0294 | 0.0262 | -0.2921 |
| -0.2480 | -0.1274 | -0.1032 | 0.0520 |
| S5 = | S11 = | S17 = | S23 = |
| -0.2933 | 0.1230 | -0.1671 | -0.1838 |
| -0.0517 | -0.0304 | -0.0185 | 0.2207 |
| -0.2071 | -0.1220 | -0.0742 | 0.2514 |
| 0.2933 | -0.1230 | 0.1671 | 0.1838 |
| 0.0517 | 0.0304 | 0.0185 | -0.2207 |
| -0.2065 | -0.1211 | -0.0736 | 0.5430 |
| S6 = | S12 = | S18 = | S24 = |
| -0.3942 | 0.1683 | -0.2685 | 0.0151 |
| -0.0582 | -0.0287 | -0.0308 | 0.1674 |
| -0.2468 | -0.1245 | -0.1179 | 0.2935 |
| 0.3942 | -0.1683 | 0.2685 | -0.0151 |
| 0.0582 | 0.0287 | 0.0308 | -0.1674 |
| -0.3357 | -0.1630 | -0.1902 | 0.3092 |

| | | |
|---------|---------|---------|
| s25 = | s31 = | s37 = |
| -0.0143 | -0.0924 | -0.0172 |
| 0.1767 | -0.0141 | 0.0898 |
| 0.3098 | -0.0462 | 0.1653 |
| 0.0143 | 0.0924 | 0.0172 |
| -0.1767 | 0.0141 | -0.0898 |
| 0.3262 | -0.0046 | 0.1581 |

| | | |
|---------|---------|---------|
| s26 = | s32 = | s38 = |
| 0.1830 | 0.0057 | 0.0736 |
| 0.3701 | 0.0524 | 0.1055 |
| 0.4331 | 0.0945 | 0.2585 |
| -0.1830 | -0.0057 | -0.0736 |
| -0.3701 | -0.0524 | -0.1055 |
| 0.8994 | 0.0940 | 0.1212 |

| | | |
|---------|---------|---------|
| s27 = | s33 = | s39 = |
| -0.1254 | -0.0155 | -0.0262 |
| 0.0083 | 0.0445 | 0.0732 |
| -0.2065 | 0.0799 | 0.1048 |
| 0.1254 | 0.0155 | 0.0262 |
| -0.0083 | -0.0445 | -0.0732 |
| 0.2366 | 0.0803 | 0.1587 |

| | | |
|---------|---------|---------|
| s28 = | s34 = | s40 = |
| 0.0084 | 0.1023 | 0.0077 |
| 0.0864 | -0.0310 | 0.0939 |
| 0.1459 | -0.0160 | 0.1607 |
| -0.0084 | -0.1023 | -0.0077 |
| -0.0864 | 0.0310 | -0.0939 |
| 0.1652 | -0.0955 | 0.1774 |

| | | |
|---------|---------|---------|
| s29 = | s35 = | s41 = |
| -0.0078 | -0.0631 | -0.0123 |
| 0.0758 | 0.0766 | 0.1014 |
| 0.1271 | 0.1709 | 0.1736 |
| 0.0078 | 0.0631 | 0.0123 |
| -0.0758 | -0.0766 | -0.1014 |
| 0.1458 | 0.1049 | 0.1914 |

| | | |
|---------|---------|---------|
| s30 = | s36 = | s42 = |
| 0.1248 | 0.0067 | 0.0308 |
| -0.1187 | 0.0847 | 0.0881 |
| -0.5637 | 0.1554 | 0.1269 |
| -0.1248 | -0.0067 | -0.0308 |
| 0.1187 | -0.0847 | -0.0881 |
| 0.1362 | 0.1495 | 0.1902 |

>>

Lampiran 6: Output Gaya Masing-Masing dari software Etabs pada Kasus Kerusakan 1

ETABS v9.5.0 File:TUGASAKHIRIB Units:KN-m Agustus 15, 2011 7:56 PAGE 1

C O L U M N F O R C E E N V E L O P E S

| STORY | No.Batang | ITEM | P | V2 | V3 | T | M2 | M3 |
|-------|-----------|-----------|---------|---------|--------|--------|--------|---------|
| LT6 | B39 | Min Value | 0,0262 | 0,0732 | 0,0000 | 0,0000 | 0,0000 | -0,1587 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0262 | 0,0732 | 0,0000 | 0,0000 | 0,0000 | 0,1048 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B40 | Min Value | -0,0077 | 0,0939 | 0,0000 | 0,0000 | 0,0000 | -0,1774 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0077 | 0,0939 | 0,0000 | 0,0000 | 0,0000 | 0,1607 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B41 | Min Value | 0,0123 | 0,1014 | 0,0000 | 0,0000 | 0,0000 | -0,1914 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0123 | 0,1014 | 0,0000 | 0,0000 | 0,0000 | 0,1736 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B42 | Min Value | -0,0308 | 0,0881 | 0,0000 | 0,0000 | 0,0000 | -0,1902 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0308 | 0,0881 | 0,0000 | 0,0000 | 0,0000 | 0,1269 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B35 | Min Value | 0,0631 | 0,0766 | 0,0000 | 0,0000 | 0,0000 | -0,1049 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0631 | 0,0766 | 0,0000 | 0,0000 | 0,0000 | 0,1709 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B36 | Min Value | -0,0067 | 0,0847 | 0,0000 | 0,0000 | 0,0000 | -0,1495 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0067 | 0,0847 | 0,0000 | 0,0000 | 0,0000 | 0,1554 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B37 | Min Value | 0,0172 | 0,0898 | 0,0000 | 0,0000 | 0,0000 | -0,1581 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0172 | 0,0898 | 0,0000 | 0,0000 | 0,0000 | 0,1653 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B38 | Min Value | -0,0736 | 0,1055 | 0,0000 | 0,0000 | 0,0000 | -0,1212 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0736 | 0,1055 | 0,0000 | 0,0000 | 0,0000 | 0,2585 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B31 | Min Value | 0,0924 | -0,0141 | 0,0000 | 0,0000 | 0,0000 | -0,0462 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0924 | -0,0141 | 0,0000 | 0,0000 | 0,0000 | 0,0046 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B32 | Min Value | -0,0057 | 0,0524 | 0,0000 | 0,0000 | 0,0000 | -0,0940 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0057 | 0,0524 | 0,0000 | 0,0000 | 0,0000 | 0,0945 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B33 | Min Value | 0,0155 | 0,0445 | 0,0000 | 0,0000 | 0,0000 | -0,0803 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0155 | 0,0445 | 0,0000 | 0,0000 | 0,0000 | 0,0799 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B34 | Min Value | -0,1023 | -0,0310 | 0,0000 | 0,0000 | 0,0000 | -0,0160 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,1023 | -0,0310 | 0,0000 | 0,0000 | 0,0000 | 0,0955 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B27 | Min Value | 0,1254 | 0,0083 | 0,0000 | 0,0000 | 0,0000 | -0,2366 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,1254 | 0,0083 | 0,0000 | 0,0000 | 0,0000 | -0,2065 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B28 | Min Value | -0,0084 | 0,0864 | 0,0000 | 0,0000 | 0,0000 | -0,1652 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0084 | 0,0864 | 0,0000 | 0,0000 | 0,0000 | 0,1459 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B29 | Min Value | 0,0078 | 0,0758 | 0,0000 | 0,0000 | 0,0000 | -0,1457 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0078 | 0,0758 | 0,0000 | 0,0000 | 0,0000 | 0,1271 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |

Lampiran 7: Coding Matlab Menghitung F_U Kasus Kerusakan 2

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);

m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);

m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);

m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);

m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);

M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);

M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);

M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);

M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);

M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);

Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);

Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);

Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);

Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eig(:, worder);

i=1:72;
pim=[mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fu=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'
```

Lampiran 8: Coding Matlab Menghitungan F_D Kasus Kerusakan 2

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192*0.5;%damage member%
I31=(1.486e-3)*0.5;%damage member%
A32=0.018*0.5;%damage member%
I32=3.465e-4*0.5;%damage member%
A33=0.018*0.5;%damage member%
I33=3.465e-4*0.5;%damage member%
A34=0.0192*0.5;%damage member%
I34=1.486e-3*0.5;%damage member%
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);

```

```

dof = 72;

ID1=[1 2 3 4 5 6];
ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);

Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);
Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);
M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);

M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

```

Lampiran 9: *Coding* Matlab Menghitung SVD Kasus Kerusakan 2

```
Fd=1e-4*[1.5136];  
Fu =1e-4*[1.4223];  
  
Fde1=Fu-Fd  
[u,s,v]=svd(Fde1)
```



Lampiran 10: Coding Matlab Menghitungn Gaya Batang Kasus 2

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);
M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

R=zeros(72, 1);
R(70, 1)=-1;

```



```

U=so1v(Ks,R);

u1=dissf(U, ID1, T1);
u2=dissf(U, ID2, T2);
u3=dissf(U, ID3, T3);
u4=dissf(U, ID4, T4);
u5=dissf(U, ID5, T5);
u6=dissf(U, ID6, T6);
u7=dissf(U, ID7, T7);
u8=dissf(U, ID8, T8);
u9=dissf(U, ID9, T9);
u10=dissf(U, ID10, T10);
u11=dissf(U, ID11, T11);
u12=dissf(U, ID12, T12);
u13=dissf(U, ID13, T13);
u14=dissf(U, ID14, T14);
u15=dissf(U, ID15, T15);
u16=dissf(U, ID16, T16);
u17=dissf(U, ID17, T17);
u18=dissf(U, ID18, T18);
u19=dissf(U, ID19, T19);
u20=dissf(U, ID20, T20);
u21=dissf(U, ID21, T21);
u22=dissf(U, ID22, T22);
u23=dissf(U, ID23, T23);
u24=dissf(U, ID24, T24);
u25=dissf(U, ID25, T25);
u26=dissf(U, ID26, T26);
u27=dissf(U, ID27, T27);
u28=dissf(U, ID28, T28);
u29=dissf(U, ID29, T29);
u30=dissf(U, ID30, T30);
u31=dissf(U, ID31, T31);
u32=dissf(U, ID32, T32);
u33=dissf(U, ID33, T33);
u34=dissf(U, ID34, T34);
u35=dissf(U, ID35, T35);
u36=dissf(U, ID36, T36);
u37=dissf(U, ID37, T37);
u38=dissf(U, ID38, T38);
u39=dissf(U, ID39, T39);
u40=dissf(U, ID40, T40);
u41=dissf(U, ID41, T41);
u42=dissf(U, ID42, T42);

So1=zeros(6,1);
So2=zeros(6,1);
So3=zeros(6,1);
So4=zeros(6,1);
So5=zeros(6,1);
So6=zeros(6,1);
So7=zeros(6,1);
So8=zeros(6,1);
So9=zeros(6,1);
So10=zeros(6,1);
So11=zeros(6,1);
So12=zeros(6,1);
So13=zeros(6,1);
So14=zeros(6,1);
So15=zeros(6,1);
So16=zeros(6,1);
So17=zeros(6,1);
So18=zeros(6,1);
So19=zeros(6,1);
So20=zeros(6,1);
So21=zeros(6,1);
So22=zeros(6,1);
So23=zeros(6,1);
So24=zeros(6,1);
So25=zeros(6,1);
So26=zeros(6,1);
So27=zeros(6,1);
So28=zeros(6,1);
So29=zeros(6,1);
So30=zeros(6,1);
So31=zeros(6,1);
So32=zeros(6,1);
So33=zeros(6,1);
So34=zeros(6,1);
So35=zeros(6,1);
So36=zeros(6,1);

So37=zeros(6,1);
So38=zeros(6,1);
So39=zeros(6,1);
So40=zeros(6,1);
So41=zeros(6,1);
So42=zeros(6,1);

S1=stref(k1,u1,So1)
S2=stref(k2,u2,So2)
S3=stref(k3,u3,So3)
S4=stref(k4,u4,So4)
S5=stref(k5,u5,So5)
S6=stref(k6,u6,So6)
S7=stref(k7,u7,So7)
S8=stref(k8,u8,So8)
S9=stref(k9,u9,So9)
S10=stref(k10,u10,So10)
S11=stref(k11,u11,So11)
S12=stref(k12,u12,So12)
S13=stref(k13,u13,So13)
S14=stref(k14,u14,So14)
S15=stref(k15,u15,So15)
S16=stref(k16,u16,So16)
S17=stref(k17,u17,So17)
S18=stref(k18,u18,So18)
S19=stref(k19,u19,So19)
S20=stref(k20,u20,So20)
S21=stref(k21,u21,So21)
S22=stref(k22,u22,So22)
S23=stref(k23,u23,So23)
S24=stref(k24,u24,So24)
S25=stref(k25,u25,So25)
S26=stref(k26,u26,So26)
S27=stref(k27,u27,So27)
S28=stref(k28,u28,So28)
S29=stref(k29,u29,So29)
S30=stref(k30,u30,So30)
S31=stref(k31,u31,So31)
S32=stref(k32,u32,So32)
S33=stref(k33,u33,So33)
S34=stref(k34,u34,So34)
S35=stref(k35,u35,So35)
S36=stref(k36,u36,So36)
S37=stref(k37,u37,So37)
S38=stref(k38,u38,So38)
S39=stref(k39,u39,So39)
S40=stref(k40,u40,So40)
S41=stref(k41,u41,So41)
S42=stref(k42,u42,So42)

```

Lampiran 11: *Output* Gaya Masing-Masing dari *software* Matlab pada Kasus Kerusakan 2

| | | | |
|---------|---------|---------|---------|
| S1 = | S7 = | S13 = | S19 = |
| 0.0669 | 0.0165 | 0.0386 | 0.6736 |
| 0.1037 | 0.1276 | 0.1171 | -0.3123 |
| 0.5934 | 0.7295 | 0.6654 | -1.4344 |
| -0.0669 | -0.0165 | -0.0386 | -0.6736 |
| -0.1037 | -0.1276 | -0.1171 | 0.3123 |
| 0.4441 | 0.5460 | 0.5057 | 0.0290 |
| S2 = | S8 = | S14 = | S20 = |
| 0.0000 | -0.0017 | 0.0568 | -0.0487 |
| 0.0954 | 0.1208 | 0.1197 | -0.1877 |
| 0.3818 | 0.4832 | 0.4775 | -0.4834 |
| -0.0000 | 0.0017 | -0.0568 | 0.0487 |
| -0.0954 | -0.1208 | -0.1197 | 0.1877 |
| 0.3818 | 0.4832 | 0.4805 | -0.3615 |
| S3 = | S9 = | S15 = | S21 = |
| -0.0668 | -0.0189 | 0.0577 | 0.0680 |
| 0.1037 | 0.1271 | 0.1252 | -0.1877 |
| 0.4438 | 0.5441 | 0.5343 | -0.4833 |
| 0.0668 | 0.0189 | -0.0577 | -0.0680 |
| -0.1037 | -0.1271 | -0.1252 | 0.1877 |
| 0.5930 | 0.7272 | 0.7180 | -0.3614 |
| S4 = | S10 = | S16 = | S22 = |
| 0.0233 | -0.0194 | 0.1864 | -0.6929 |
| 0.1218 | 0.1277 | 0.0757 | -0.3122 |
| 0.7010 | 0.7283 | 0.4578 | -1.4343 |
| -0.0233 | 0.0194 | -0.1864 | 0.6929 |
| -0.1218 | -0.1277 | -0.0757 | 0.3122 |
| 0.5172 | 0.5488 | 0.2990 | 0.0293 |
| S5 = | S11 = | S17 = | S23 = |
| 0.0003 | -0.0128 | 0.4574 | 0.5699 |
| 0.1099 | 0.1252 | 0.0538 | -0.2454 |
| 0.4395 | 0.5000 | 0.2170 | -0.6223 |
| -0.0003 | 0.0128 | -0.4574 | -0.5699 |
| -0.1099 | -0.1252 | -0.0538 | 0.2454 |
| 0.4396 | 0.5012 | 0.2138 | -0.2613 |
| S6 = | S12 = | S18 = | S24 = |
| -0.0227 | -0.0082 | 0.7466 | -0.0404 |
| 0.1217 | 0.1271 | 0.0881 | -0.2546 |
| 0.5165 | 0.5472 | 0.3369 | -0.4644 |
| 0.0227 | 0.0082 | -0.7466 | 0.0404 |
| -0.1217 | -0.1271 | -0.0881 | 0.2546 |
| 0.7003 | 0.7240 | 0.5440 | -0.4522 |

| | | |
|---------|---------|---------|
| s25 = | s31 = | s37 = |
| 0.0598 | 0.3205 | 0.0397 |
| -0.2545 | -0.2056 | -0.2901 |
| -0.4643 | -0.3697 | -0.5199 |
| -0.0598 | -0.3205 | -0.0397 |
| 0.2545 | 0.2056 | 0.2901 |
| -0.4520 | -0.3705 | -0.5244 |

| | | |
|---------|---------|---------|
| s26 = | s32 = | s38 = |
| -0.5892 | -0.0218 | -0.2133 |
| -0.2454 | -0.2959 | -0.1957 |
| -0.6223 | -0.5341 | -0.3546 |
| 0.5892 | 0.0218 | 0.2133 |
| 0.2454 | 0.2959 | 0.1957 |
| -0.2613 | -0.5310 | -0.3498 |

| | | |
|---------|---------|---------|
| s27 = | s33 = | s39 = |
| 0.4481 | 0.0417 | 0.0757 |
| -0.2221 | -0.2947 | -0.1864 |
| -0.4398 | -0.5324 | -0.2131 |
| -0.4481 | -0.0417 | -0.0757 |
| 0.2221 | 0.2947 | 0.1864 |
| -0.3598 | -0.5285 | -0.4578 |

| | | |
|---------|---------|---------|
| s28 = | s34 = | s40 = |
| -0.0285 | -0.3404 | -0.0218 |
| -0.2777 | -0.2038 | -0.2710 |
| -0.5045 | -0.3643 | -0.4597 |
| 0.0285 | 0.3404 | 0.0218 |
| 0.2777 | 0.2038 | 0.2710 |
| -0.4951 | -0.3694 | -0.5160 |

| | | |
|---------|---------|---------|
| s29 = | s35 = | s41 = |
| 0.0480 | 0.1928 | 0.0342 |
| -0.2775 | -0.2250 | -0.2892 |
| -0.5041 | -0.3578 | -0.4904 |
| -0.0480 | -0.1928 | -0.0342 |
| 0.2775 | 0.2250 | 0.2892 |
| -0.4949 | -0.4522 | -0.5508 |

| | | |
|---------|---------|---------|
| s30 = | s36 = | s42 = |
| -0.4676 | -0.0192 | -0.0881 |
| -0.2227 | -0.2893 | -0.2534 |
| -0.4390 | -0.5178 | -0.3682 |
| 0.4676 | 0.0192 | 0.0881 |
| 0.2227 | 0.2893 | 0.2534 |
| -0.3628 | -0.5235 | -0.5440 |

>>

Lampiran 12 : Output Gaya Masing-Masing dari software Etabs pada Kasus Kerusakan 2

ETABS v9.5.0 File:TUGASAKHIR3 Units:KN-m Agustus 18, 2011 9:56 PAGE 1

C O L U M N F O R C E E N V E L O P E S

| STORY | No.Batang | ITEM | P | V2 | V3 | T | M2 | M3 |
|-------|-----------|-----------|---------|---------|--------|--------|--------|---------|
| LT6 | B39 | Min Value | -0,0757 | -0,1864 | 0,0000 | 0,0000 | 0,0000 | -0,2131 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0757 | -0,1864 | 0,0000 | 0,0000 | 0,0000 | 0,4578 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B40 | Min Value | 0,0218 | -0,2710 | 0,0000 | 0,0000 | 0,0000 | -0,4597 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0218 | -0,2710 | 0,0000 | 0,0000 | 0,0000 | 0,5160 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B41 | Min Value | -0,0343 | -0,2892 | 0,0000 | 0,0000 | 0,0000 | -0,4904 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0343 | -0,2892 | 0,0000 | 0,0000 | 0,0000 | 0,5507 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B42 | Min Value | 0,0881 | -0,2534 | 0,0000 | 0,0000 | 0,0000 | -0,3682 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0881 | -0,2534 | 0,0000 | 0,0000 | 0,0000 | 0,5440 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B35 | Min Value | -0,1928 | -0,2250 | 0,0000 | 0,0000 | 0,0000 | -0,3578 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,1928 | -0,2250 | 0,0000 | 0,0000 | 0,0000 | 0,4523 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B36 | Min Value | 0,0192 | -0,2892 | 0,0000 | 0,0000 | 0,0000 | -0,5178 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0192 | -0,2892 | 0,0000 | 0,0000 | 0,0000 | 0,5235 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B37 | Min Value | -0,0397 | -0,2901 | 0,0000 | 0,0000 | 0,0000 | -0,5199 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0397 | -0,2901 | 0,0000 | 0,0000 | 0,0000 | 0,5244 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B38 | Min Value | 0,2133 | -0,1957 | 0,0000 | 0,0000 | 0,0000 | -0,3546 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,2133 | -0,1957 | 0,0000 | 0,0000 | 0,0000 | 0,3498 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B31 | Min Value | -0,3205 | -0,2056 | 0,0000 | 0,0000 | 0,0000 | -0,3697 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,3205 | -0,2056 | 0,0000 | 0,0000 | 0,0000 | 0,3706 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B32 | Min Value | 0,0218 | -0,2959 | 0,0000 | 0,0000 | 0,0000 | -0,5341 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0218 | -0,2959 | 0,0000 | 0,0000 | 0,0000 | 0,5310 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B33 | Min Value | -0,0417 | -0,2947 | 0,0000 | 0,0000 | 0,0000 | -0,5324 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0417 | -0,2947 | 0,0000 | 0,0000 | 0,0000 | 0,5285 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B34 | Min Value | 0,3404 | -0,2038 | 0,0000 | 0,0000 | 0,0000 | -0,3644 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,3404 | -0,2038 | 0,0000 | 0,0000 | 0,0000 | 0,3694 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B27 | Min Value | -0,4481 | -0,2221 | 0,0000 | 0,0000 | 0,0000 | -0,4398 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,4481 | -0,2221 | 0,0000 | 0,0000 | 0,0000 | 0,3599 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B28 | Min Value | 0,0285 | -0,2777 | 0,0000 | 0,0000 | 0,0000 | -0,5045 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0285 | -0,2777 | 0,0000 | 0,0000 | 0,0000 | 0,4951 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B29 | Min Value | -0,0480 | -0,2775 | 0,0000 | 0,0000 | 0,0000 | -0,5041 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0480 | -0,2775 | 0,0000 | 0,0000 | 0,0000 | 0,4949 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |

Lampiran 13 : Coding Matlab Menghitungkan F_U Kasus Kerusakan 3

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);

m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);

m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);

m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);

m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);

M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);

M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);

M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);

M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);

M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);

Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);

Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);

Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);

Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fu=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'
```


Lampiran 14: Coding Matlab Menghitung F_D Kasus Kerusakan

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192*0.5;%damage member%
I31=(1.486e-3)*0.5;%damage
member%
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

```

```

ID1=[1 2 3 4 5 6];
ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);

Ks=Ks+assf(K41, ID41, dof);
Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);

M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eig(:, worder);

i=1:72;
pim=[mode(10, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'
```

Lampiran 15: *Coding* Matlab Menghitung SVD Kasus Kerusakan 3

```
Fd=1e-3*[0.0108 0.0160  
0.0160 0.1428];  
Fu =1.e-3 *[0.0108 0.0160  
0.0160 0.1422];  
  
Fde1=Fu-Fd  
[u,s,v]=svd(Fde1)
```



Lampiran 16: Coding Matlab Menghitung Gaya Batang Kasus 3

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);

M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'

```

```

R=zeros(72,1);
R(10,1)=1;
R(70,1)=0;

U=so1v(Ks,R);

u1=dissf(U,ID1,T1);
u2=dissf(U,ID2,T2);
u3=dissf(U,ID3,T3);
u4=dissf(U,ID4,T4);
u5=dissf(U,ID5,T5);
u6=dissf(U,ID6,T6);
u7=dissf(U,ID7,T7);
u8=dissf(U,ID8,T8);
u9=dissf(U,ID9,T9);
u10=dissf(U,ID10,T10);
u11=dissf(U,ID11,T11);
u12=dissf(U,ID12,T12);
u13=dissf(U,ID13,T13);
u14=dissf(U,ID14,T14);
u15=dissf(U,ID15,T15);
u16=dissf(U,ID16,T16);
u17=dissf(U,ID17,T17);
u18=dissf(U,ID18,T18);
u19=dissf(U,ID19,T19);
u20=dissf(U,ID20,T20);
u21=dissf(U,ID21,T21);
u22=dissf(U,ID22,T22);
u23=dissf(U,ID23,T23);
u24=dissf(U,ID24,T24);
u25=dissf(U,ID25,T25);
u26=dissf(U,ID26,T26);
u27=dissf(U,ID27,T27);
u28=dissf(U,ID28,T28);
u29=dissf(U,ID29,T29);
u30=dissf(U,ID30,T30);
u31=dissf(U,ID31,T31);
u32=dissf(U,ID32,T32);
u33=dissf(U,ID33,T33);
u34=dissf(U,ID34,T34);
u35=dissf(U,ID35,T35);
u36=dissf(U,ID36,T36);
u37=dissf(U,ID37,T37);
u38=dissf(U,ID38,T38);
u39=dissf(U,ID39,T39);
u40=dissf(U,ID40,T40);
u41=dissf(U,ID41,T41);
u42=dissf(U,ID42,T42);

So1=zeros(6,1);
So2=zeros(6,1);
So3=zeros(6,1);
So4=zeros(6,1);
So5=zeros(6,1);
So6=zeros(6,1);
So7=zeros(6,1);
So8=zeros(6,1);
So9=zeros(6,1);
So10=zeros(6,1);
So11=zeros(6,1);
So12=zeros(6,1);
So13=zeros(6,1);
So14=zeros(6,1);
So15=zeros(6,1);
So16=zeros(6,1);
So17=zeros(6,1);
So18=zeros(6,1);
So19=zeros(6,1);
So20=zeros(6,1);
So21=zeros(6,1);
So22=zeros(6,1);
So23=zeros(6,1);
So24=zeros(6,1);
So25=zeros(6,1);
So26=zeros(6,1);
So27=zeros(6,1);
So28=zeros(6,1);
So29=zeros(6,1);
So30=zeros(6,1);
So31=zeros(6,1);
So32=zeros(6,1);
So33=zeros(6,1);

So34=zeros(6,1);
So35=zeros(6,1);
So36=zeros(6,1);
So37=zeros(6,1);
So38=zeros(6,1);
So39=zeros(6,1);
So40=zeros(6,1);
So41=zeros(6,1);
So42=zeros(6,1);

S1=stref(k1,u1,So1)
S2=stref(k2,u2,So2)
S3=stref(k3,u3,So3)
S4=stref(k4,u4,So4)
S5=stref(k5,u5,So5)
S6=stref(k6,u6,So6)
S7=stref(k7,u7,So7)
S8=stref(k8,u8,So8)
S9=stref(k9,u9,So9)
S10=stref(k10,u10,So10)
S11=stref(k11,u11,So11)
S12=stref(k12,u12,So12)
S13=stref(k13,u13,So13)
S14=stref(k14,u14,So14)
S15=stref(k15,u15,So15)
S16=stref(k16,u16,So16)
S17=stref(k17,u17,So17)
S18=stref(k18,u18,So18)
S19=stref(k19,u19,So19)
S20=stref(k20,u20,So20)
S21=stref(k21,u21,So21)
S22=stref(k22,u22,So22)
S23=stref(k23,u23,So23)
S24=stref(k24,u24,So24)
S25=stref(k25,u25,So25)
S26=stref(k26,u26,So26)
S27=stref(k27,u27,So27)
S28=stref(k28,u28,So28)
S29=stref(k29,u29,So29)
S30=stref(k30,u30,So30)
S31=stref(k31,u31,So31)
S32=stref(k32,u32,So32)
S33=stref(k33,u33,So33)
S34=stref(k34,u34,So34)
S35=stref(k35,u35,So35)
S36=stref(k36,u36,So36)
S37=stref(k37,u37,So37)
S38=stref(k38,u38,So38)
S39=stref(k39,u39,So39)
S40=stref(k40,u40,So40)
S41=stref(k41,u41,So41)
S42=stref(k42,u42,So42)

```

Lampiran 17: *Output* Gaya Masing-Masing dari *software* Matlab pada Kasus Kerusakan 3

| | | | |
|---------|------------|------------|---------|
| S1 = | S2 = | S3 = | S4 = |
| -0.2407 | -0.3039 | -0.3890 | -0.0659 |
| -0.0399 | -0.0369 | -0.0419 | -0.0169 |
| -0.2274 | -0.1469 | -0.1792 | -0.0984 |
| 0.2407 | 0.3039 | 0.3890 | 0.0659 |
| 0.0399 | 0.0369 | 0.0419 | 0.0169 |
| -0.1715 | -0.1480 | -0.2398 | -0.0710 |
| S5 = | S10 = | S15 = | S19 = |
| -0.1019 | 0.0081 | 1.0e-003 * | -0.0622 |
| -0.0140 | -0.0006 | | 0.2787 |
| -0.0560 | -0.0027 | | 0.9036 |
| 0.1019 | -0.0081 | -0.7384 | 0.0622 |
| 0.0140 | 0.0006 | -0.1473 | -0.2787 |
| -0.0562 | -0.0029 | -0.6269 | 0.3504 |
| | | 0.7384 | |
| | | 0.1473 | |
| | | -0.8457 | |
| S6 = | S11 = | S16 = | S20 = |
| -0.1326 | 0.0051 | | 0.0055 |
| -0.0091 | -0.0013 | 1.0e-003 * | 0.1149 |
| -0.0452 | -0.0050 | | 0.2820 |
| 0.1326 | -0.0051 | | -0.0055 |
| 0.0091 | 0.0013 | 0.1667 | -0.1149 |
| -0.0461 | -0.0050 | 0.0288 | 0.2352 |
| | | 0.0512 | |
| | | -0.1667 | |
| | | -0.0288 | |
| | | 0.2365 | |
| S7 = | S12 = | S17 = | S21 = |
| 0.0197 | 0.0016 | | 0.0009 |
| -0.0048 | -0.0010 | 1.0e-003 * | 0.1270 |
| -0.0273 | -0.0045 | | 0.3097 |
| -0.0197 | -0.0016 | | -0.0009 |
| 0.0048 | 0.0010 | | -0.1270 |
| -0.0203 | -0.0059 | | 0.2619 |
| | | -0.0363 | |
| | | -0.1560 | |
| | | -0.6607 | |
| | | 0.0363 | |
| | | 0.1560 | |
| | | -0.5873 | |
| S8 = | S13 = | S18 = | S22 = |
| 0.0074 | 1.0e-003 * | | 0.0558 |
| -0.0041 | -0.0442 | | 0.4794 |
| -0.0169 | -0.0556 | | 1.3718 |
| -0.0074 | -0.3694 | | -0.0558 |
| 0.0041 | 0.0442 | | -0.4794 |
| -0.0158 | 0.0556 | | 0.7853 |
| | -0.1862 | 1.0e-003 * | |
| | | -0.2569 | |
| | | 0.0049 | |
| | | 0.0994 | |
| | | 0.2569 | |
| | | -0.0049 | |
| | | -0.0499 | |
| S9 = | S14 = | S23 = | |
| 0.0004 | | -0.0223 | |
| -0.0035 | -0.0003 | 0.0380 | |
| -0.0155 | -0.0003 | -0.1230 | |
| -0.0004 | -0.0013 | 0.0223 | |
| 0.0035 | 0.0003 | -0.0380 | |
| -0.0200 | 0.0003 | 0.2598 | |
| | -0.0013 | | |

| | | | |
|---------|---------|------------|------------|
| s24 = | s30 = | s36 = | s41 = |
| 0.0024 | 0.0047 | -0.0005 | |
| 0.0517 | 0.0010 | 0.0004 | 1.0e-003 * |
| 0.0832 | -0.0256 | 0.0003 | |
| -0.0024 | -0.0047 | 0.0005 | 0.1610 |
| -0.0517 | -0.0010 | -0.0004 | 0.2206 |
| 0.1030 | 0.0291 | 0.0012 | 0.3064 |
| | | | -0.1610 |
| | | | -0.2206 |
| | | | 0.4879 |
| s25 = | s31 = | s37 = | s42 = |
| 0.0060 | -0.0006 | 0.0003 | |
| 0.0419 | -0.0082 | 0.0007 | 1.0e-003 * |
| 0.0652 | -0.0336 | 0.0009 | |
| -0.0060 | 0.0006 | -0.0003 | -0.0049 |
| -0.0419 | 0.0082 | -0.0007 | -0.2569 |
| 0.0857 | 0.0040 | 0.0016 | -0.9748 |
| | | | 0.0049 |
| | | | 0.2569 |
| | | | 0.0499 |
| s26 = | s32 = | s38 = | >> |
| 0.0139 | -0.0012 | 0.0001 | |
| -0.1316 | 0.0034 | -0.0010 | |
| -0.5455 | 0.0048 | -0.0054 | |
| -0.0139 | 0.0012 | -0.0001 | |
| 0.1316 | -0.0034 | 0.0010 | |
| 0.0717 | 0.0076 | 0.0018 | |
| | | | |
| s27 = | s33 = | s39 = | |
| -0.0053 | 0.0006 | 1.0e-003 * | |
| -0.0279 | 0.0042 | | |
| -0.1615 | 0.0065 | 0.0288 | |
| 0.0053 | -0.0006 | -0.1667 | |
| 0.0279 | -0.0042 | -0.5490 | |
| 0.0610 | 0.0086 | -0.0288 | |
| | | 0.1667 | |
| | | -0.0512 | |
| s28 = | s34 = | s40 = | |
| -0.0005 | 0.0012 | 1.0e-003 * | |
| 0.0157 | 0.0006 | | |
| 0.0241 | -0.0091 | -0.1848 | |
| 0.0005 | -0.0012 | 0.2030 | |
| -0.0157 | -0.0006 | 0.3065 | |
| 0.0324 | 0.0113 | 0.1848 | |
| | | -0.2030 | |
| | | 0.4243 | |
| s29 = | s35 = | | |
| 0.0011 | -0.0000 | | |
| 0.0113 | -0.0001 | | |
| 0.0157 | -0.0014 | | |
| -0.0011 | 0.0000 | | |
| -0.0113 | 0.0001 | | |
| 0.0249 | 0.0009 | | |

Lampiran 18: *Output* Gaya Masing-Masing dari *software* Etabs pada Kasus Kerusakan 3

ETABS v9.5.0 File:TUGASAKHIR6 Units:KN-m Agustus 24, 2011 2:45 PAGE 1

C O L U M N F O R C E E N V E L O P E S

| STORY | NO.Batang | ITEM | P | V2 | V3 | T | M2 | M3 |
|-------|-----------|-----------|----------|----------|---------|---------|---------|----------|
| LT6 | B39 | Min Value | -0,00003 | -0,00017 | 0,00000 | 0,00000 | 0,00000 | -0,00055 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00003 | -0,00017 | 0,00000 | 0,00000 | 0,00000 | 0,00005 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B40 | Min Value | 0,00019 | 0,00020 | 0,00000 | 0,00000 | 0,00000 | -0,00042 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00019 | 0,00020 | 0,00000 | 0,00000 | 0,00000 | 0,00031 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B41 | Min Value | -0,00016 | 0,00022 | 0,00000 | 0,00000 | 0,00000 | -0,00049 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00016 | 0,00022 | 0,00000 | 0,00000 | 0,00000 | 0,00031 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B42 | Min Value | 0,00001 | -0,00026 | 0,00000 | 0,00000 | 0,00000 | -0,00098 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00001 | -0,00026 | 0,00000 | 0,00000 | 0,00000 | -0,00005 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B35 | Min Value | 0,00003 | -0,00012 | 0,00000 | 0,00000 | 0,00000 | -0,00136 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00003 | -0,00012 | 0,00000 | 0,00000 | 0,00000 | -0,00092 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B36 | Min Value | 0,00046 | 0,00042 | 0,00000 | 0,00000 | 0,00000 | -0,00118 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00046 | 0,00042 | 0,00000 | 0,00000 | 0,00000 | 0,00033 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B37 | Min Value | -0,00034 | 0,00070 | 0,00000 | 0,00000 | 0,00000 | -0,00164 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00034 | 0,00070 | 0,00000 | 0,00000 | 0,00000 | 0,00087 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B38 | Min Value | -0,00014 | -0,00100 | 0,00000 | 0,00000 | 0,00000 | -0,00540 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00014 | -0,00100 | 0,00000 | 0,00000 | 0,00000 | -0,00182 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B31 | Min Value | 0,00058 | -0,00822 | 0,00000 | 0,00000 | 0,00000 | -0,03362 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00058 | -0,00822 | 0,00000 | 0,00000 | 0,00000 | -0,00403 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B32 | Min Value | 0,00115 | 0,00343 | 0,00000 | 0,00000 | 0,00000 | -0,00759 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00115 | 0,00343 | 0,00000 | 0,00000 | 0,00000 | 0,00478 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B33 | Min Value | -0,00055 | 0,00419 | 0,00000 | 0,00000 | 0,00000 | -0,00862 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00055 | 0,00419 | 0,00000 | 0,00000 | 0,00000 | 0,00645 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B23 | Min Value | -0,00118 | 0,00060 | 0,00000 | 0,00000 | 0,00000 | -0,01126 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00118 | 0,00060 | 0,00000 | 0,00000 | 0,00000 | -0,00910 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B27 | Min Value | 0,00535 | -0,02791 | 0,00000 | 0,00000 | 0,00000 | -0,16145 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00535 | -0,02791 | 0,00000 | 0,00000 | 0,00000 | -0,06095 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B28 | Min Value | 0,00047 | 0,01569 | 0,00000 | 0,00000 | 0,00000 | -0,03241 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,00047 | 0,01569 | 0,00000 | 0,00000 | 0,00000 | 0,02406 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B29 | Min Value | -0,00109 | 0,01127 | 0,00000 | 0,00000 | 0,00000 | -0,02486 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,00109 | 0,01127 | 0,00000 | 0,00000 | 0,00000 | 0,01570 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |

Lampiran 19 : Coding Matlab Menghitungkan F_U Kasus Kerusakan 4

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);

m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);

m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);

m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);

m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);

M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);

M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);

M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);

M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);

M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);

Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);

Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);

Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);

Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fu=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'

```

Lampiran 20: Coding Matlab Menghitung F_D Kasus Kerusakan

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192*0.5;%damage member%
I31=(1.486e-3)*0.5;%damage
member%
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

```

```

ID1=[1 2 3 4 5 6];
ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=Ks+assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);

Ks=Ks+assf(K41, ID41, dof);
Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);

M27=kg(m27, T27);
M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))'

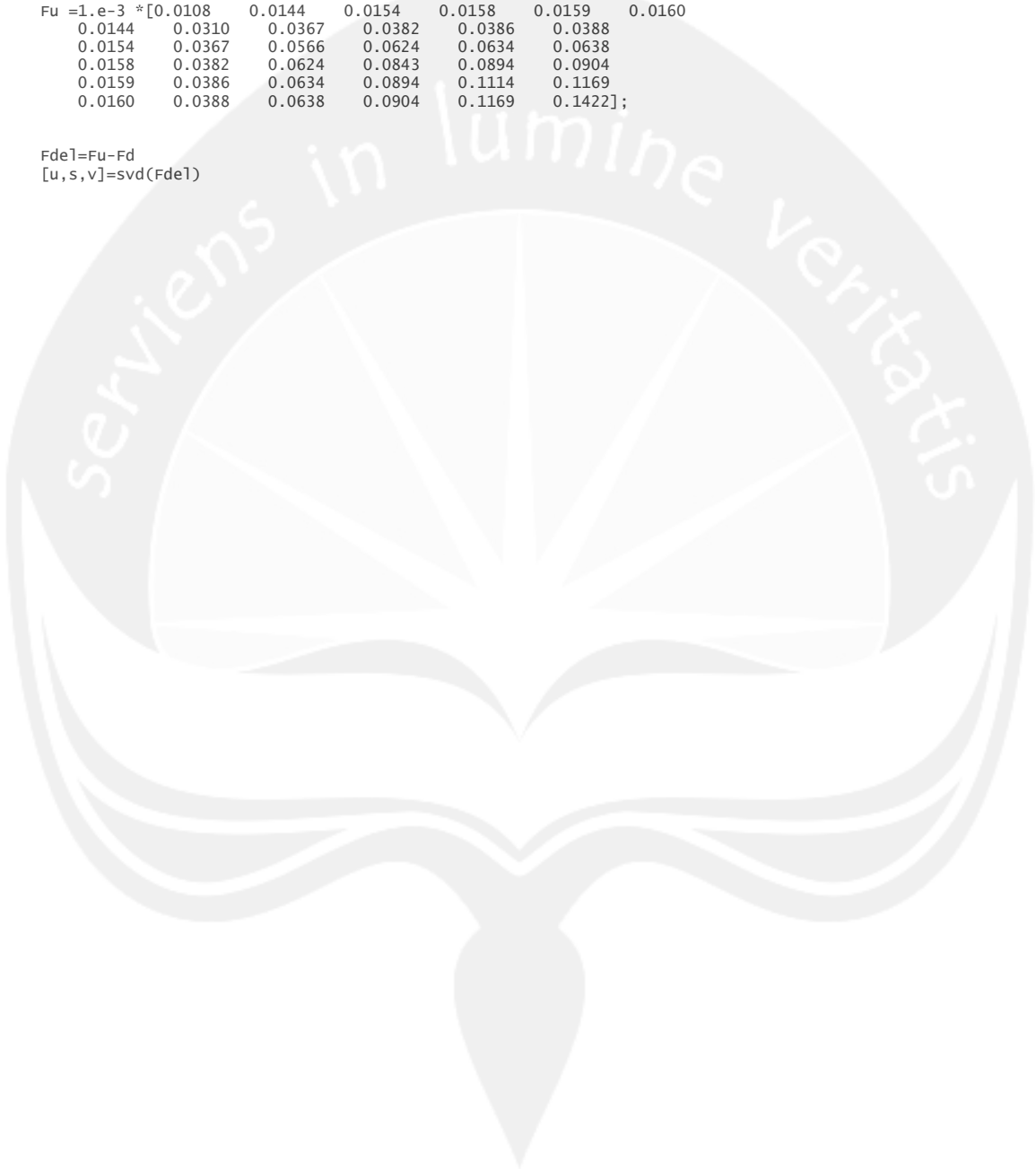
```

Lampiran 21: Coding Matlab Menghitung SVD Kasus Kerusakan 4

```
Fd=1e-3*[0.0108 0.0145 0.0154 0.0158 0.0159 0.0160
0.0145 0.0310 0.0369 0.0383 0.0386 0.0387
0.0154 0.0369 0.0570 0.0628 0.0634 0.0638
0.0158 0.0383 0.0628 0.0851 0.0900 0.0909
0.0159 0.0386 0.0634 0.0900 0.1121 0.1174
0.0160 0.0387 0.0638 0.0909 0.1174 0.1428];

Fu =1.e-3 *[0.0108 0.0144 0.0154 0.0158 0.0159 0.0160
0.0144 0.0310 0.0367 0.0382 0.0386 0.0388
0.0154 0.0367 0.0566 0.0624 0.0634 0.0638
0.0158 0.0382 0.0624 0.0843 0.0894 0.0904
0.0159 0.0386 0.0634 0.0894 0.1114 0.1169
0.0160 0.0388 0.0638 0.0904 0.1169 0.1422];

Fde1=Fu-Fd
[u,s,v]=svd(Fde1)
```



Lampiran 22: Coding Matlab Menghitungn Gaya Batang Kasus 4

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192; %damage member%
I31=1.486e-3; %damage member%
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);
M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);

M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

```

```

R=zeros(72,1);
R(10,1)=-0.8222;
R(22,1)=-0.4357;
R(34,1)=0.0566;
R(46,1)=0.1687;
R(58,1)=0.0826;
R(70,1)=-0.3094;

U=solv(Ks,R);

u1=dissf(U,ID1,T1);
u2=dissf(U,ID2,T2);
u3=dissf(U,ID3,T3);
u4=dissf(U,ID4,T4);
u5=dissf(U,ID5,T5);
u6=dissf(U,ID6,T6);
u7=dissf(U,ID7,T7);
u8=dissf(U,ID8,T8);
u9=dissf(U,ID9,T9);
u10=dissf(U,ID10,T10);
u11=dissf(U,ID11,T11);
u12=dissf(U,ID12,T12);
u13=dissf(U,ID13,T13);
u14=dissf(U,ID14,T14);
u15=dissf(U,ID15,T15);
u16=dissf(U,ID16,T16);
u17=dissf(U,ID17,T17);
u18=dissf(U,ID18,T18);
u19=dissf(U,ID19,T19);
u20=dissf(U,ID20,T20);
u21=dissf(U,ID21,T21);
u22=dissf(U,ID22,T22);
u23=dissf(U,ID23,T23);
u24=dissf(U,ID24,T24);
u25=dissf(U,ID25,T25);
u26=dissf(U,ID26,T26);
u27=dissf(U,ID27,T27);
u28=dissf(U,ID28,T28);
u29=dissf(U,ID29,T29);
u30=dissf(U,ID30,T30);
u31=dissf(U,ID31,T31);
u32=dissf(U,ID32,T32);
u33=dissf(U,ID33,T33);
u34=dissf(U,ID34,T34);
u35=dissf(U,ID35,T35);
u36=dissf(U,ID36,T36);
u37=dissf(U,ID37,T37);
u38=dissf(U,ID38,T38);
u39=dissf(U,ID39,T39);
u40=dissf(U,ID40,T40);
u41=dissf(U,ID41,T41);
u42=dissf(U,ID42,T42);

So1=zeros(6,1);
So2=zeros(6,1);
So3=zeros(6,1);
So4=zeros(6,1);
So5=zeros(6,1);
So6=zeros(6,1);
So7=zeros(6,1);
So8=zeros(6,1);
So9=zeros(6,1);
So10=zeros(6,1);
So11=zeros(6,1);
So12=zeros(6,1);
So13=zeros(6,1);
So14=zeros(6,1);
So15=zeros(6,1);
So16=zeros(6,1);
So17=zeros(6,1);
So18=zeros(6,1);
So19=zeros(6,1);
So20=zeros(6,1);
So21=zeros(6,1);
So22=zeros(6,1);
So23=zeros(6,1);
So24=zeros(6,1);
So25=zeros(6,1);
So26=zeros(6,1);
So27=zeros(6,1);
So28=zeros(6,1);

So29=zeros(6,1);
So30=zeros(6,1);
So31=zeros(6,1);
So32=zeros(6,1);
So33=zeros(6,1);
So34=zeros(6,1);
So35=zeros(6,1);
So36=zeros(6,1);
So37=zeros(6,1);
So38=zeros(6,1);
So39=zeros(6,1);
So40=zeros(6,1);
So41=zeros(6,1);
So42=zeros(6,1);

S1=stref(k1,u1,So1)
S2=stref(k2,u2,So2)
S3=stref(k3,u3,So3)
S4=stref(k4,u4,So4)
S5=stref(k5,u5,So5)
S6=stref(k6,u6,So6)
S7=stref(k7,u7,So7)
S8=stref(k8,u8,So8)
S9=stref(k9,u9,So9)
S10=stref(k10,u10,So10)
S11=stref(k11,u11,So11)
S12=stref(k12,u12,So12)
S13=stref(k13,u13,So13)
S14=stref(k14,u14,So14)
S15=stref(k15,u15,So15)
S16=stref(k16,u16,So16)
S17=stref(k17,u17,So17)
S18=stref(k18,u18,So18)
S19=stref(k19,u19,So19)
S20=stref(k20,u20,So20)
S21=stref(k21,u21,So21)
S22=stref(k22,u22,So22)
S23=stref(k23,u23,So23)
S24=stref(k24,u24,So24)
S25=stref(k25,u25,So25)
S26=stref(k26,u26,So26)
S27=stref(k27,u27,So27)
S28=stref(k28,u28,So28)
S29=stref(k29,u29,So29)
S30=stref(k30,u30,So30)
S31=stref(k31,u31,So31)
S32=stref(k32,u32,So32)
S33=stref(k33,u33,So33)
S34=stref(k34,u34,So34)
S35=stref(k35,u35,So35)
S36=stref(k36,u36,So36)
S37=stref(k37,u37,So37)
S38=stref(k38,u38,So38)
S39=stref(k39,u39,So39)
S40=stref(k40,u40,So40)
S41=stref(k41,u41,So41)
S42=stref(k42,u42,So42)

```

Lampiran 23: *Output* Gaya Masing-Masing dari *software* Matlab pada Kasus Kerusakan 4

| | | | |
|---------|---------|---------|---------|
| S1 = | S7 = | S13 = | S19 = |
| 0.2471 | -0.0161 | -0.0111 | 0.2000 |
| 0.0683 | 0.0208 | 0.0281 | -0.3792 |
| 0.3901 | 0.1197 | 0.1596 | -1.3299 |
| -0.2471 | 0.0161 | 0.0111 | -0.2000 |
| -0.0683 | -0.0208 | -0.0281 | 0.3792 |
| 0.2934 | 0.0886 | 0.1211 | -0.3767 |

| | | | |
|---------|---------|---------|---------|
| S2 = | S8 = | S14 = | S20 = |
| 0.2957 | 0.0010 | -0.0271 | -0.0169 |
| 0.0629 | 0.0196 | 0.0289 | -0.1688 |
| 0.2509 | 0.0787 | 0.1150 | -0.4198 |
| -0.2957 | -0.0010 | 0.0271 | 0.0169 |
| -0.0629 | -0.0196 | -0.0289 | 0.1688 |
| 0.2519 | 0.0781 | 0.1162 | -0.3397 |

| | | | |
|---------|---------|---------|---------|
| S3 = | S9 = | S15 = | S21 = |
| 0.3597 | 0.0119 | -0.0484 | 0.0174 |
| 0.0735 | 0.0143 | 0.0323 | -0.1806 |
| 0.3114 | 0.0663 | 0.1359 | -0.4469 |
| -0.3597 | -0.0119 | 0.0484 | -0.0174 |
| -0.0735 | -0.0143 | -0.0323 | 0.1806 |
| 0.4236 | 0.0768 | 0.1868 | -0.3658 |

| | | | |
|---------|---------|---------|---------|
| S4 = | S10 = | S16 = | S22 = |
| 0.1563 | -0.0601 | 0.0631 | -0.2006 |
| 0.0411 | 0.0205 | 0.0212 | -0.5308 |
| 0.2372 | 0.1160 | 0.1283 | -1.7187 |
| -0.1563 | 0.0601 | -0.0631 | 0.2006 |
| -0.0411 | -0.0205 | -0.0212 | 0.5308 |
| 0.1734 | 0.0888 | 0.0837 | -0.6698 |

| | | | |
|---------|---------|---------|---------|
| S5 = | S11 = | S17 = | S23 = |
| 0.2236 | -0.0844 | 0.1392 | 0.1316 |
| 0.0357 | 0.0214 | 0.0146 | -0.1321 |
| 0.1429 | 0.0859 | 0.0592 | -0.0134 |
| -0.2236 | 0.0844 | -0.1392 | -0.1316 |
| -0.0357 | -0.0214 | -0.0146 | 0.1321 |
| 0.1427 | 0.0855 | 0.0580 | -0.4623 |

| | | | |
|---------|---------|---------|---------|
| S6 = | S12 = | S18 = | S24 = |
| 0.2969 | -0.1141 | 0.2228 | -0.0114 |
| 0.0341 | 0.0202 | 0.0262 | -0.1202 |
| 0.1500 | 0.0877 | 0.0992 | -0.2046 |
| -0.2969 | 0.1141 | -0.2228 | 0.0114 |
| -0.0341 | -0.0202 | -0.0262 | 0.1202 |
| 0.1907 | 0.1148 | 0.1626 | -0.2282 |

S25 =

| | | |
|---------|---------|---------|
| 0.0068 | S31 = | S37 = |
| -0.1165 | 0.0698 | 0.0149 |
| -0.1976 | 0.0081 | -0.0622 |
| -0.0068 | 0.0185 | -0.1155 |
| 0.1165 | -0.0698 | -0.0149 |
| -0.2220 | -0.0081 | 0.0622 |
| | 0.0105 | -0.1085 |
| S26 = | S32 = | S38 = |
| -0.1271 | -0.0048 | -0.0584 |
| -0.0683 | -0.0358 | -0.0525 |
| 0.2462 | -0.0651 | -0.1516 |
| 0.1271 | 0.0048 | 0.0584 |
| 0.0683 | 0.0358 | 0.0525 |
| -0.4920 | -0.0636 | -0.0374 |
| S27 = | S33 = | S39 = |
| 0.0906 | 0.0137 | 0.0212 |
| 0.0241 | -0.0325 | -0.0631 |
| 0.2251 | -0.0593 | -0.0989 |
| -0.0906 | -0.0137 | -0.0212 |
| -0.0241 | 0.0325 | 0.0631 |
| -0.1382 | -0.0577 | -0.1283 |
| S28 = | S34 = | S40 = |
| -0.0060 | -0.0787 | -0.0066 |
| -0.0529 | 0.0021 | -0.0761 |
| -0.0881 | -0.0293 | -0.1310 |
| 0.0060 | 0.0787 | 0.0066 |
| 0.0529 | -0.0021 | 0.0761 |
| -0.1022 | 0.0368 | -0.1429 |
| S29 = | S35 = | S41 = |
| 0.0084 | 0.0493 | 0.0115 |
| -0.0433 | -0.0520 | -0.0836 |
| -0.0707 | -0.1265 | -0.1437 |
| -0.0084 | -0.0493 | -0.0115 |
| 0.0433 | 0.0520 | 0.0836 |
| -0.0851 | -0.0607 | -0.1571 |
| S30 = | S36 = | S42 = |
| -0.0930 | -0.0057 | -0.0262 |
| 0.0705 | -0.0601 | -0.0866 |
| 0.3013 | -0.1111 | -0.1494 |
| 0.0930 | 0.0057 | 0.0262 |
| -0.0705 | 0.0601 | 0.0866 |
| -0.0474 | -0.1052 | -0.1626 |

>>

Lampiran 24 : Output Gaya Masing-Masing dari software Etabs pada Kasus Kerusakan 4

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C O L U M N F O R C E E N V E L O P E S

| STORY | NO.Batang | ITEM | P | V2 | V3 | T | M2 | M3 |
|-------|-----------|-----------|---------|---------|--------|--------|--------|---------|
| LT6 | B39 | Min Value | -0,0212 | -0,0631 | 0,0000 | 0,0000 | 0,0000 | -0,0989 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0212 | -0,0631 | 0,0000 | 0,0000 | 0,0000 | 0,1283 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B40 | Min Value | 0,0066 | -0,0761 | 0,0000 | 0,0000 | 0,0000 | -0,1310 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0066 | -0,0761 | 0,0000 | 0,0000 | 0,0000 | 0,1429 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B41 | Min Value | -0,0115 | -0,0836 | 0,0000 | 0,0000 | 0,0000 | -0,1437 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0115 | -0,0836 | 0,0000 | 0,0000 | 0,0000 | 0,1571 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B42 | Min Value | 0,0262 | -0,0867 | 0,0000 | 0,0000 | 0,0000 | -0,1494 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0262 | -0,0867 | 0,0000 | 0,0000 | 0,0000 | 0,1626 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B35 | Min Value | -0,0493 | -0,0520 | 0,0000 | 0,0000 | 0,0000 | -0,1265 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0493 | -0,0520 | 0,0000 | 0,0000 | 0,0000 | 0,0607 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B36 | Min Value | 0,0057 | -0,0601 | 0,0000 | 0,0000 | 0,0000 | -0,1111 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0057 | -0,0601 | 0,0000 | 0,0000 | 0,0000 | 0,1052 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B37 | Min Value | -0,0149 | -0,0622 | 0,0000 | 0,0000 | 0,0000 | -0,1155 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0149 | -0,0622 | 0,0000 | 0,0000 | 0,0000 | 0,1085 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B38 | Min Value | 0,0584 | -0,0525 | 0,0000 | 0,0000 | 0,0000 | -0,1516 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0584 | -0,0525 | 0,0000 | 0,0000 | 0,0000 | 0,0374 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B31 | Min Value | -0,0698 | 0,0081 | 0,0000 | 0,0000 | 0,0000 | -0,0105 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0698 | 0,0081 | 0,0000 | 0,0000 | 0,0000 | 0,0185 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B32 | Min Value | 0,0048 | -0,0357 | 0,0000 | 0,0000 | 0,0000 | -0,0651 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0048 | -0,0357 | 0,0000 | 0,0000 | 0,0000 | 0,0636 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B33 | Min Value | -0,0137 | -0,0325 | 0,0000 | 0,0000 | 0,0000 | -0,0593 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0137 | -0,0325 | 0,0000 | 0,0000 | 0,0000 | 0,0577 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B34 | Min Value | 0,0787 | 0,0021 | 0,0000 | 0,0000 | 0,0000 | -0,0368 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0787 | 0,0021 | 0,0000 | 0,0000 | 0,0000 | -0,0293 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B27 | Min Value | -0,0906 | 0,0241 | 0,0000 | 0,0000 | 0,0000 | 0,1382 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0906 | 0,0241 | 0,0000 | 0,0000 | 0,0000 | 0,2251 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B28 | Min Value | 0,0060 | -0,0529 | 0,0000 | 0,0000 | 0,0000 | -0,0881 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0060 | -0,0529 | 0,0000 | 0,0000 | 0,0000 | 0,1022 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B29 | Min Value | -0,0084 | -0,0433 | 0,0000 | 0,0000 | 0,0000 | -0,0707 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0084 | -0,0433 | 0,0000 | 0,0000 | 0,0000 | 0,0851 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |

Lampiran 25: Coding Matlab Menghitungn F_U Kasus Kerusakan 5

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);

M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fu=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

```

Lampiran 26: Coding Matlab Menghitung F_D Kasus Kerusakan 5

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158*0.5;
I9=1.165e-3*0.5;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=(1.486e-3);
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);
k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;
ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);

M28=kg(m28, T28);
M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

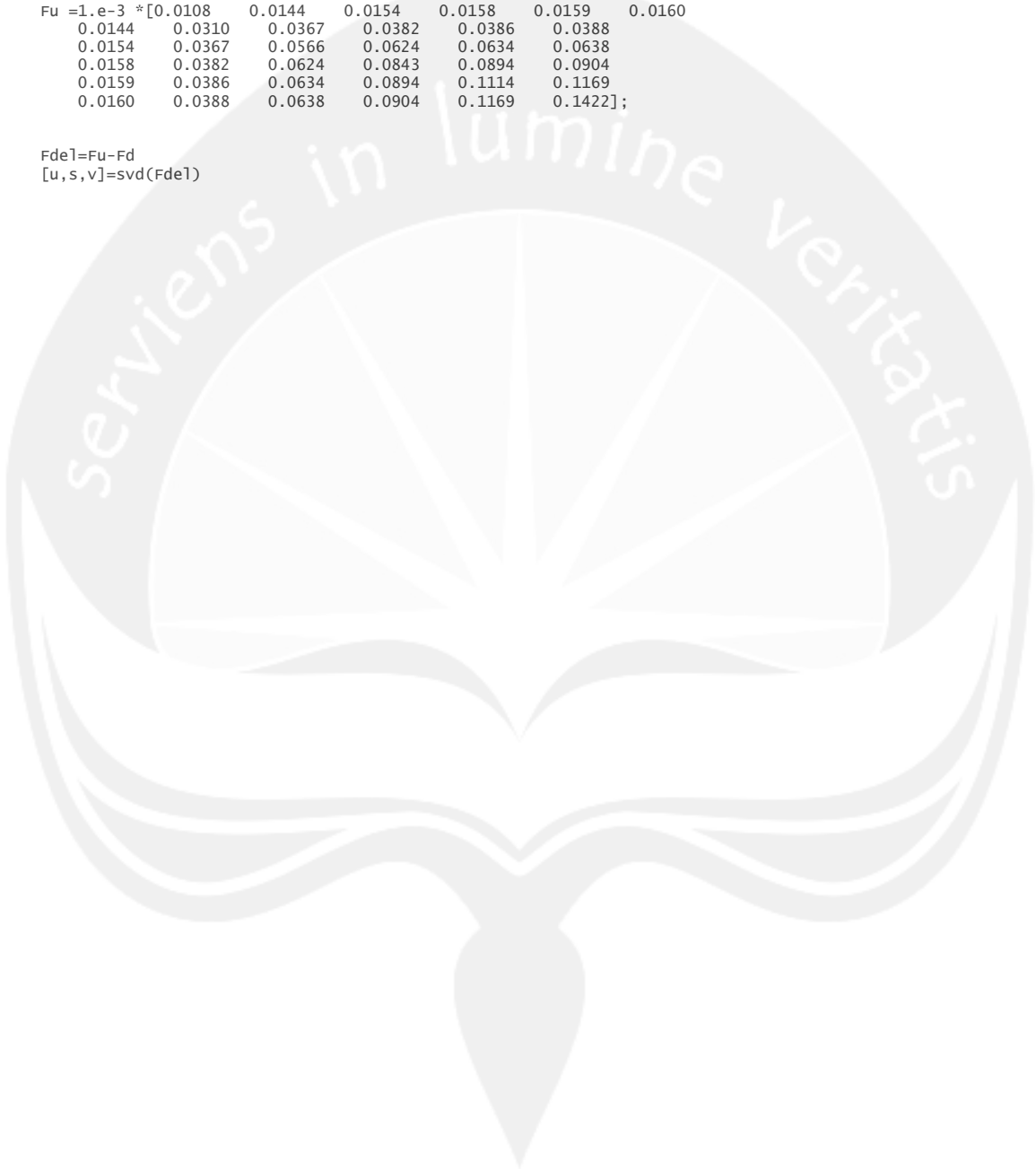
```

Lampiran 27: Coding Matlab Menghitung SVD Kasus Kerusakan 5

```
Fd=1e-3*[0.0108 0.0145 0.0154 0.0159 0.0160 0.0161
0.0145 0.0311 0.0372 0.0387 0.0391 0.0392
0.0154 0.0372 0.0585 0.0646 0.0654 0.0659
0.0159 0.0387 0.0646 0.0877 0.0928 0.0939
0.0160 0.0391 0.0654 0.0928 0.1151 0.1205
0.0161 0.0392 0.0659 0.0939 0.1205 0.1459];

Fu =1.e-3 *[0.0108 0.0144 0.0154 0.0158 0.0159 0.0160
0.0144 0.0310 0.0367 0.0382 0.0386 0.0388
0.0154 0.0367 0.0566 0.0624 0.0634 0.0638
0.0158 0.0382 0.0624 0.0843 0.0894 0.0904
0.0159 0.0386 0.0634 0.0894 0.1114 0.1169
0.0160 0.0388 0.0638 0.0904 0.1169 0.1422];

Fde1=Fu-Fd
[u,s,v]=svd(Fde1)
```



Lampiran 28 : Coding Matlab Menghitung Gaya Batang Kasus 5

```

n1=coor(0,0);
n2=coor(10,0);
n3=coor(18,0);
n4=coor(28,0);
n5=coor(0,4.5);
n6=coor(10,4.5);
n7=coor(18,4.5);
n8=coor(28,4.5);
n9=coor(0,8.1);
n10=coor(10,8.1);
n11=coor(18,8.1);
n12=coor(28,8.1);
n13=coor(0,11.7);
n14=coor(10,11.7);
n15=coor(18,11.7);
n16=coor(28,11.7);
n17=coor(0,15.3);
n18=coor(10,15.3);
n19=coor(18,15.3);
n20=coor(28,15.3);
n21=coor(0,18.9);
n22=coor(10,18.9);
n23=coor(18,18.9);
n24=coor(28,18.9);
n25=coor(0,22.5);
n26=coor(10,22.5);
n27=coor(18,22.5);
n28=coor(28,22.5);

[L1,T1]=memf(n5,n6);
[L2,T2]=memf(n6,n7);
[L3,T3]=memf(n7,n8);
[L4,T4]=memf(n9,n10);
[L5,T5]=memf(n10,n11);
[L6,T6]=memf(n11,n12);
[L7,T7]=memf(n13,n14);
[L8,T8]=memf(n14,n15);
[L9,T9]=memf(n15,n16);
[L10,T10]=memf(n17,n18);
[L11,T11]=memf(n18,n19);
[L12,T12]=memf(n19,n20);
[L13,T13]=memf(n21,n22);
[L14,T14]=memf(n22,n23);
[L15,T15]=memf(n23,n24);
[L16,T16]=memf(n25,n26);
[L17,T17]=memf(n26,n27);
[L18,T18]=memf(n27,n28);
[L19,T19]=memf(n1,n5);
[L20,T20]=memf(n2,n6);
[L21,T21]=memf(n3,n7);
[L22,T22]=memf(n4,n8);
[L23,T23]=memf(n5,n9);
[L24,T24]=memf(n6,n10);
[L25,T25]=memf(n7,n11);
[L26,T26]=memf(n8,n12);
[L27,T27]=memf(n9,n13);
[L28,T28]=memf(n10,n14);
[L29,T29]=memf(n11,n15);
[L30,T30]=memf(n12,n16);
[L31,T31]=memf(n13,n17);
[L32,T32]=memf(n14,n18);
[L33,T33]=memf(n15,n19);
[L34,T34]=memf(n16,n20);
[L35,T35]=memf(n17,n21);
[L36,T36]=memf(n18,n22);
[L37,T37]=memf(n19,n23);
[L38,T38]=memf(n20,n24);
[L39,T39]=memf(n21,n25);
[L40,T40]=memf(n22,n26);
[L41,T41]=memf(n23,n27);
[L42,T42]=memf(n24,n28);

E=1.999e8;
A1=0.0158;
I1=1.165e-3;
A2=0.0158;
I2=1.165e-3;
A3=0.0158;
I3=1.165e-3;
A4=0.0158;
I4=1.165e-3;
A5=0.0158;
I5=1.165e-3;

A6=0.0158;
I6=1.165e-3;
A7=0.0158;
I7=1.165e-3;
A8=0.0158;
I8=1.165e-3;
A9=0.0158;
I9=1.165e-3;
A10=0.0158;
I10=1.165e-3;
A11=0.0158;
I11=1.165e-3;
A12=0.0158;
I12=1.165e-3;
A13=0.0158;
I13=1.165e-3;
A14=0.0158;
I14=1.165e-3;
A15=0.0158;
I15=1.165e-3;
A16=0.0158;
I16=1.165e-3;
A17=0.0158;
I17=1.165e-3;
A18=0.0158;
I18=1.165e-3;
A19=0.0266;
I19=3.064e-3;
A20=0.0248;
I20=6.316e-4;
A21=0.0248;
I21=6.316e-4;
A22=0.0266;
I22=3.064e-3;
A23=0.0266;
I23=3.064e-3;
A24=0.018;
I24=3.465e-4;
A25=0.018;
I25=3.465e-4;
A26=0.0266;
I26=3.064e-3;
A27=0.0266;
I27=3.064e-3;
A28=0.018;
I28=3.465e-4;
A29=0.018;
I29=3.465e-4;
A30=0.0266;
I30=3.064e-3;
A31=0.0192;
I31=1.486e-3;
A32=0.018;
I32=3.465e-4;
A33=0.018;
I33=3.465e-4;
A34=0.0192;
I34=1.486e-3;
A35=0.0192;
I35=1.486e-3;
A36=0.018;
I36=3.465e-4;
A37=0.018;
I37=3.465e-4;
A38=0.0192;
I38=1.486e-3;
A39=0.0192;
I39=1.486e-3;
A40=0.018;
I40=3.465e-4;
A41=0.018;
I41=3.465e-4;
A42=0.0192;
I42=1.486e-3;

k1=k1f(E,A1,I1,L1);
k2=k1f(E,A2,I2,L2);
k3=k1f(E,A3,I3,L3);
k4=k1f(E,A4,I4,L4);
k5=k1f(E,A5,I5,L5);
k6=k1f(E,A6,I6,L6);
k7=k1f(E,A7,I7,L7);

k8=k1f(E,A8,I8,L8);
k9=k1f(E,A9,I9,L9);
k10=k1f(E,A10,I10,L10);
k11=k1f(E,A11,I11,L11);
k12=k1f(E,A12,I12,L12);
k13=k1f(E,A13,I13,L13);
k14=k1f(E,A14,I14,L14);
k15=k1f(E,A15,I15,L15);
k16=k1f(E,A16,I16,L16);
k17=k1f(E,A17,I17,L17);
k18=k1f(E,A18,I18,L18);
k19=k1f(E,A19,I19,L19);
k20=k1f(E,A20,I20,L20);
k21=k1f(E,A21,I21,L21);
k22=k1f(E,A22,I22,L22);
k23=k1f(E,A23,I23,L23);
k24=k1f(E,A24,I24,L24);
k25=k1f(E,A25,I25,L25);
k26=k1f(E,A26,I26,L26);
k27=k1f(E,A27,I27,L27);
k28=k1f(E,A28,I28,L28);
k29=k1f(E,A29,I29,L29);
k30=k1f(E,A30,I30,L30);
k31=k1f(E,A31,I31,L31);
k32=k1f(E,A32,I32,L32);
k33=k1f(E,A33,I33,L33);
k34=k1f(E,A34,I34,L34);
k35=k1f(E,A35,I35,L35);
k36=k1f(E,A36,I36,L36);
k37=k1f(E,A37,I37,L37);
k38=k1f(E,A38,I38,L38);
k39=k1f(E,A39,I39,L39);
k40=k1f(E,A40,I40,L40);
k41=k1f(E,A41,I41,L41);
k42=k1f(E,A42,I42,L42);

K1=kg(k1,T1);
K2=kg(k2,T2);
K3=kg(k3,T3);
K4=kg(k4,T4);
K5=kg(k5,T5);
K6=kg(k6,T6);
K7=kg(k7,T7);
K8=kg(k8,T8);
K9=kg(k9,T9);
K10=kg(k10,T10);
K11=kg(k11,T11);
K12=kg(k12,T12);
K13=kg(k13,T13);
K14=kg(k14,T14);
K15=kg(k15,T15);
K16=kg(k16,T16);
K17=kg(k17,T17);
K18=kg(k18,T18);
K19=kg(k19,T19);
K20=kg(k20,T20);
K21=kg(k21,T21);
K22=kg(k22,T22);
K23=kg(k23,T23);
K24=kg(k24,T24);
K25=kg(k25,T25);
K26=kg(k26,T26);
K27=kg(k27,T27);
K28=kg(k28,T28);
K29=kg(k29,T29);
K30=kg(k30,T30);
K31=kg(k31,T31);
K32=kg(k32,T32);
K33=kg(k33,T33);
K34=kg(k34,T34);
K35=kg(k35,T35);
K36=kg(k36,T36);
K37=kg(k37,T37);
K38=kg(k38,T38);
K39=kg(k39,T39);
K40=kg(k40,T40);
K41=kg(k41,T41);
K42=kg(k42,T42);

dof = 72;

ID1=[1 2 3 4 5 6];

```

```

ID2=[4 5 6 7 8 9];
ID3=[7 8 9 10 11 12];
ID4=[13 14 15 16 17 18];
ID5=[16 17 18 19 20 21];
ID6=[19 20 21 22 23 24];
ID7=[25 26 27 28 29 30];
ID8=[28 29 30 31 32 33];
ID9=[31 32 33 34 35 36];
ID10=[37 38 39 40 41 42];
ID11=[40 41 42 43 44 45];
ID12=[43 44 45 46 47 48];
ID13=[49 50 51 52 53 54];
ID14=[52 53 54 55 56 57];
ID15=[55 56 57 58 59 60];
ID16=[61 62 63 64 65 66];
ID17=[64 65 66 67 68 69];
ID18=[67 68 69 70 71 72];
ID19=[0 0 0 1 2 3];
ID20=[0 0 0 4 5 6];
ID21=[0 0 0 7 8 9];
ID22=[0 0 0 10 11 12];
ID23=[1 2 3 13 14 15];
ID24=[4 5 6 16 17 18];
ID25=[7 8 9 19 20 21];
ID26=[10 11 12 22 23 24];
ID27=[13 14 15 25 26 27];
ID28=[16 17 18 28 29 30];
ID29=[19 20 21 31 32 33];
ID30=[22 23 24 34 35 36];
ID31=[25 26 27 37 38 39];
ID32=[28 29 30 40 41 42];
ID33=[31 32 33 43 44 45];
ID34=[34 35 36 46 47 48];
ID35=[37 38 39 49 50 51];
ID36=[40 41 42 52 53 54];
ID37=[43 44 45 55 56 57];
ID38=[46 47 48 58 59 60];
ID39=[49 50 51 61 62 63];
ID40=[52 53 54 64 65 66];
ID41=[55 56 57 67 68 69];
ID42=[58 59 60 70 71 72];

Ks=assf(K1, ID1, dof);
Ks=Ks+assf(K2, ID2, dof);
Ks=Ks+assf(K3, ID3, dof);
Ks=Ks+assf(K4, ID4, dof);
Ks=Ks+assf(K5, ID5, dof);
Ks=Ks+assf(K6, ID6, dof);
Ks=Ks+assf(K7, ID7, dof);
Ks=Ks+assf(K8, ID8, dof);
Ks=Ks+assf(K9, ID9, dof);
Ks=Ks+assf(K10, ID10, dof);
Ks=Ks+assf(K11, ID11, dof);
Ks=Ks+assf(K12, ID12, dof);
Ks=Ks+assf(K13, ID13, dof);
Ks=Ks+assf(K14, ID14, dof);
Ks=Ks+assf(K15, ID15, dof);
Ks=Ks+assf(K16, ID16, dof);
Ks=Ks+assf(K17, ID17, dof);
Ks=Ks+assf(K18, ID18, dof);
Ks=Ks+assf(K19, ID19, dof);
Ks=Ks+assf(K20, ID20, dof);
Ks=Ks+assf(K21, ID21, dof);
Ks=Ks+assf(K22, ID22, dof);
Ks=Ks+assf(K23, ID23, dof);
Ks=Ks+assf(K24, ID24, dof);
Ks=Ks+assf(K25, ID25, dof);
Ks=Ks+assf(K26, ID26, dof);
Ks=Ks+assf(K27, ID27, dof);
Ks=Ks+assf(K28, ID28, dof);
Ks=Ks+assf(K29, ID29, dof);
Ks=Ks+assf(K30, ID30, dof);
Ks=Ks+assf(K31, ID31, dof);
Ks=Ks+assf(K32, ID32, dof);
Ks=Ks+assf(K33, ID33, dof);
Ks=Ks+assf(K34, ID34, dof);
Ks=Ks+assf(K35, ID35, dof);
Ks=Ks+assf(K36, ID36, dof);
Ks=Ks+assf(K37, ID37, dof);
Ks=Ks+assf(K38, ID38, dof);
Ks=Ks+assf(K39, ID39, dof);
Ks=Ks+assf(K40, ID40, dof);
Ks=Ks+assf(K41, ID41, dof);

Ks=Ks+assf(K42, ID42, dof);

rho=7.8271;
rhob=9.5063;
m1=mlf(rhob*A1, L1);
m2=mlf(rhob*A2, L2);
m3=mlf(rhob*A3, L3);
m4=mlf(rhob*A4, L4);
m5=mlf(rhob*A5, L5);
m6=mlf(rhob*A6, L6);
m7=mlf(rhob*A7, L7);
m8=mlf(rhob*A8, L8);
m9=mlf(rhob*A9, L9);
m10=mlf(rhob*A10, L10);
m11=mlf(rhob*A11, L11);
m12=mlf(rhob*A12, L12);
m13=mlf(rhob*A13, L13);
m14=mlf(rhob*A14, L14);
m15=mlf(rhob*A15, L15);
m16=mlf(rhob*A16, L16);
m17=mlf(rhob*A17, L17);
m18=mlf(rhob*A18, L18);
m19=mlf(rhob*A19, L19);
m20=mlf(rhob*A20, L20);
m21=mlf(rhob*A21, L21);
m22=mlf(rhob*A22, L22);
m23=mlf(rhob*A23, L23);
m24=mlf(rhob*A24, L24);
m25=mlf(rhob*A25, L25);
m26=mlf(rhob*A26, L26);
m27=mlf(rhob*A27, L27);
m28=mlf(rhob*A28, L28);
m29=mlf(rhob*A29, L29);
m30=mlf(rhob*A30, L30);
m31=mlf(rhob*A31, L31);
m32=mlf(rhob*A32, L32);
m33=mlf(rhob*A33, L33);
m34=mlf(rhob*A34, L34);
m35=mlf(rhob*A35, L35);
m36=mlf(rhob*A36, L36);
m37=mlf(rhob*A37, L37);
m38=mlf(rhob*A38, L38);
m39=mlf(rhob*A39, L39);
m40=mlf(rhob*A40, L40);
m41=mlf(rhob*A41, L41);
m42=mlf(rhob*A42, L42);

M1=kg(m1, T1);
M2=kg(m2, T2);
M3=kg(m3, T3);
M4=kg(m4, T4);
M5=kg(m5, T5);
M6=kg(m6, T6);
M7=kg(m7, T7);
M8=kg(m8, T8);
M9=kg(m9, T9);
M10=kg(m10, T10);
M11=kg(m11, T11);
M12=kg(m12, T12);
M13=kg(m13, T13);
M14=kg(m14, T14);
M15=kg(m15, T15);
M16=kg(m16, T16);
M17=kg(m17, T17);
M18=kg(m18, T18);
M19=kg(m19, T19);
M20=kg(m20, T20);
M21=kg(m21, T21);
M22=kg(m22, T22);
M23=kg(m23, T23);
M24=kg(m24, T24);
M25=kg(m25, T25);
M26=kg(m26, T26);
M27=kg(m27, T27);
M28=kg(m28, T28);

M29=kg(m29, T29);
M30=kg(m30, T30);
M31=kg(m31, T31);
M32=kg(m32, T32);
M33=kg(m33, T33);
M34=kg(m34, T34);
M35=kg(m35, T35);
M36=kg(m36, T36);
M37=kg(m37, T37);
M38=kg(m38, T38);
M39=kg(m39, T39);
M40=kg(m40, T40);
M41=kg(m41, T41);
M42=kg(m42, T42);

Mr=assf(M1, ID1, dof);
Mr=Mr+assf(M2, ID2, dof);
Mr=Mr+assf(M3, ID3, dof);
Mr=Mr+assf(M4, ID4, dof);
Mr=Mr+assf(M5, ID5, dof);
Mr=Mr+assf(M6, ID6, dof);
Mr=Mr+assf(M7, ID7, dof);
Mr=Mr+assf(M8, ID8, dof);
Mr=Mr+assf(M9, ID9, dof);
Mr=Mr+assf(M10, ID10, dof);
Mr=Mr+assf(M11, ID11, dof);
Mr=Mr+assf(M12, ID12, dof);
Mr=Mr+assf(M13, ID13, dof);
Mr=Mr+assf(M14, ID14, dof);
Mr=Mr+assf(M15, ID15, dof);
Mr=Mr+assf(M16, ID16, dof);
Mr=Mr+assf(M17, ID17, dof);
Mr=Mr+assf(M18, ID18, dof);
Mr=Mr+assf(M19, ID19, dof);
Mr=Mr+assf(M20, ID20, dof);
Mr=Mr+assf(M21, ID21, dof);
Mr=Mr+assf(M22, ID22, dof);
Mr=Mr+assf(M23, ID23, dof);
Mr=Mr+assf(M24, ID24, dof);
Mr=Mr+assf(M25, ID25, dof);
Mr=Mr+assf(M26, ID26, dof);
Mr=Mr+assf(M27, ID27, dof);
Mr=Mr+assf(M28, ID28, dof);
Mr=Mr+assf(M29, ID29, dof);
Mr=Mr+assf(M30, ID30, dof);
Mr=Mr+assf(M31, ID31, dof);
Mr=Mr+assf(M32, ID32, dof);
Mr=Mr+assf(M33, ID33, dof);
Mr=Mr+assf(M34, ID34, dof);
Mr=Mr+assf(M35, ID35, dof);
Mr=Mr+assf(M36, ID36, dof);
Mr=Mr+assf(M37, ID37, dof);
Mr=Mr+assf(M38, ID38, dof);
Mr=Mr+assf(M39, ID39, dof);
Mr=Mr+assf(M40, ID40, dof);
Mr=Mr+assf(M41, ID41, dof);
Mr=Mr+assf(M42, ID42, dof);

[eigv, eigval]=eig(Mr\Ks);
[w, worder]=sort(sqrt(diag(eigval)));
mode=eigv(:, worder);

i=1:72;
pim=[mode(10, i); mode(22, i); mode(34, i); mode(46, i); mode(58, i); mode(70, i)];
v=sqrtm(mode'*Mr*mode);
wm=diag(w(1:72));
Fd=(pim*inv(v))*inv(wm^2)*(pim*inv(v))';

R=zeros(72, 1);

```

```

R(10,1)=-0.4033;
R(22,1)=-0.1637;
R(34,1)=-0.1626;
R(46,1)=0.6594;
R(58,1)=0.0841;
R(70,1)=-0.5850;

U=so1v(Ks,R);

u1=dissf(U,ID1,T1);
u2=dissf(U,ID2,T2);
u3=dissf(U,ID3,T3);
u4=dissf(U,ID4,T4);
u5=dissf(U,ID5,T5);
u6=dissf(U,ID6,T6);
u7=dissf(U,ID7,T7);
u8=dissf(U,ID8,T8);
u9=dissf(U,ID9,T9);
u10=dissf(U,ID10,T10);
u11=dissf(U,ID11,T11);
u12=dissf(U,ID12,T12);
u13=dissf(U,ID13,T13);
u14=dissf(U,ID14,T14);
u15=dissf(U,ID15,T15);
u16=dissf(U,ID16,T16);
u17=dissf(U,ID17,T17);
u18=dissf(U,ID18,T18);
u19=dissf(U,ID19,T19);
u20=dissf(U,ID20,T20);
u21=dissf(U,ID21,T21);
u22=dissf(U,ID22,T22);
u23=dissf(U,ID23,T23);
u24=dissf(U,ID24,T24);
u25=dissf(U,ID25,T25);
u26=dissf(U,ID26,T26);
u27=dissf(U,ID27,T27);
u28=dissf(U,ID28,T28);
u29=dissf(U,ID29,T29);
u30=dissf(U,ID30,T30);
u31=dissf(U,ID31,T31);
u32=dissf(U,ID32,T32);
u33=dissf(U,ID33,T33);
u34=dissf(U,ID34,T34);
u35=dissf(U,ID35,T35);
u36=dissf(U,ID36,T36);
u37=dissf(U,ID37,T37);
u38=dissf(U,ID38,T38);
u39=dissf(U,ID39,T39);
u40=dissf(U,ID40,T40);
u41=dissf(U,ID41,T41);
u42=dissf(U,ID42,T42);

So1=zeros(6,1);
So2=zeros(6,1);
So3=zeros(6,1);
So4=zeros(6,1);
So5=zeros(6,1);
So6=zeros(6,1);
So7=zeros(6,1);
So8=zeros(6,1);
So9=zeros(6,1);
So10=zeros(6,1);
So11=zeros(6,1);
So12=zeros(6,1);
So13=zeros(6,1);
So14=zeros(6,1);
So15=zeros(6,1);
So16=zeros(6,1);
So17=zeros(6,1);
So18=zeros(6,1);
So19=zeros(6,1);
So20=zeros(6,1);
So21=zeros(6,1);
So22=zeros(6,1);
So23=zeros(6,1);
So24=zeros(6,1);
So25=zeros(6,1);
So26=zeros(6,1);
So27=zeros(6,1);
So28=zeros(6,1);
So29=zeros(6,1);

So30=zeros(6,1);
So31=zeros(6,1);
So32=zeros(6,1);
So33=zeros(6,1);
So34=zeros(6,1);
So35=zeros(6,1);
So36=zeros(6,1);
So37=zeros(6,1);
So38=zeros(6,1);
So39=zeros(6,1);
So40=zeros(6,1);
So41=zeros(6,1);
So42=zeros(6,1);

S1=stref(k1,u1,So1)
S2=stref(k2,u2,So2)
S3=stref(k3,u3,So3)
S4=stref(k4,u4,So4)
S5=stref(k5,u5,So5)
S6=stref(k6,u6,So6)
S7=stref(k7,u7,So7)
S8=stref(k8,u8,So8)
S9=stref(k9,u9,So9)
S10=stref(k10,u10,So10)
S11=stref(k11,u11,So11)
S12=stref(k12,u12,So12)
S13=stref(k13,u13,So13)
S14=stref(k14,u14,So14)
S15=stref(k15,u15,So15)
S16=stref(k16,u16,So16)
S17=stref(k17,u17,So17)
S18=stref(k18,u18,So18)
S19=stref(k19,u19,So19)
S20=stref(k20,u20,So20)
S21=stref(k21,u21,So21)
S22=stref(k22,u22,So22)
S23=stref(k23,u23,So23)
S24=stref(k24,u24,So24)
S25=stref(k25,u25,So25)
S26=stref(k26,u26,So26)
S27=stref(k27,u27,So27)
S28=stref(k28,u28,So28)
S29=stref(k29,u29,So29)
S30=stref(k30,u30,So30)
S31=stref(k31,u31,So31)
S32=stref(k32,u32,So32)
S33=stref(k33,u33,So33)
S34=stref(k34,u34,So34)
S35=stref(k35,u35,So35)
S36=stref(k36,u36,So36)
S37=stref(k37,u37,So37)
S38=stref(k38,u38,So38)
S39=stref(k39,u39,So39)
S40=stref(k40,u40,So40)
S41=stref(k41,u41,So41)
S42=stref(k42,u42,So42)

```


Lampiran 29: *Output* Gaya Masing-Masing dari *software* Matlab pada Kasus Kerusakan 5

| | | | |
|---------|---------|---------|---------|
| S1 = | S7 = | S13 = | S19 = |
| 0.1161 | 0.0122 | -0.0149 | 0.1712 |
| 0.0292 | 0.0070 | 0.0523 | -0.1715 |
| 0.1666 | 0.0394 | 0.2972 | -0.5907 |
| -0.1161 | -0.0122 | 0.0149 | -0.1712 |
| -0.0292 | -0.0070 | -0.0523 | 0.1715 |
| 0.1252 | 0.0302 | 0.2258 | -0.1812 |
| S2 = | S8 = | S14 = | S20 = |
| 0.1414 | 0.0144 | -0.0518 | -0.0146 |
| 0.0273 | 0.0081 | 0.0525 | -0.0747 |
| 0.1090 | 0.0333 | 0.2090 | -0.1854 |
| -0.1414 | -0.0144 | 0.0518 | 0.0146 |
| -0.0273 | -0.0081 | -0.0525 | 0.0747 |
| 0.1097 | 0.0318 | 0.2107 | -0.1509 |
| S3 = | S9 = | S15 = | S21 = |
| 0.1734 | 0.0243 | -0.0955 | 0.0245 |
| 0.0316 | 0.0002 | 0.0628 | -0.0802 |
| 0.1337 | 0.0062 | 0.2617 | -0.1981 |
| -0.1734 | -0.0243 | 0.0955 | -0.0245 |
| -0.0316 | -0.0002 | -0.0628 | 0.0802 |
| 0.1822 | -0.0043 | 0.3666 | -0.1629 |
| S4 = | S10 = | S16 = | S22 = |
| 0.0828 | -0.1502 | 0.1256 | -0.1811 |
| 0.0153 | 0.0265 | 0.0409 | -0.2447 |
| 0.0886 | 0.1514 | 0.2470 | -0.7775 |
| -0.0828 | 0.1502 | -0.1256 | 0.1811 |
| -0.0153 | -0.0265 | -0.0409 | 0.2447 |
| 0.0645 | 0.1141 | 0.1616 | -0.3234 |
| S5 = | S11 = | S17 = | S23 = |
| 0.1164 | -0.2449 | 0.2708 | 0.1420 |
| 0.0140 | 0.0272 | 0.0275 | -0.0554 |
| 0.0563 | 0.1084 | 0.1104 | 0.0146 |
| -0.1164 | 0.2449 | -0.2708 | -0.1420 |
| -0.0140 | -0.0272 | -0.0275 | 0.0554 |
| 0.0558 | 0.1092 | 0.1093 | -0.2140 |
| S6 = | S12 = | S18 = | S24 = |
| 0.1522 | -0.3582 | 0.4302 | -0.0127 |
| 0.0130 | 0.0240 | 0.0496 | -0.0495 |
| 0.0563 | 0.1058 | 0.1891 | -0.0833 |
| -0.1522 | 0.3582 | -0.4302 | 0.0127 |
| -0.0130 | -0.0240 | -0.0496 | 0.0495 |
| 0.0737 | 0.1341 | 0.3064 | -0.0948 |

| | | |
|---------|---------|---------|
| s25 = | s31 = | s37 = |
| 0.0203 | 0.1197 | 0.0324 |
| -0.0482 | 0.0396 | -0.1157 |
| -0.0806 | -0.0125 | -0.2194 |
| -0.0203 | -0.1197 | -0.0324 |
| 0.0482 | -0.0396 | 0.1157 |
| -0.0928 | 0.1549 | -0.1970 |

| | | |
|---------|---------|---------|
| s26 = | s32 = | s38 = |
| -0.1496 | -0.0126 | -0.1124 |
| -0.0148 | -0.0137 | -0.1663 |
| 0.1413 | -0.0325 | -0.4829 |
| 0.1496 | 0.0126 | 0.1124 |
| 0.0148 | 0.0137 | 0.1663 |
| -0.1945 | -0.0167 | -0.1156 |

| | | |
|---------|---------|---------|
| s27 = | s33 = | s39 = |
| 0.1267 | 0.0292 | 0.0409 |
| 0.0274 | -0.0024 | -0.1256 |
| 0.1254 | -0.0129 | -0.2051 |
| -0.1267 | -0.0292 | -0.0409 |
| -0.0274 | 0.0024 | 0.1256 |
| -0.0269 | 0.0044 | -0.2470 |

| | | |
|---------|---------|---------|
| s28 = | s34 = | s40 = |
| -0.0114 | -0.1364 | -0.0134 |
| -0.0158 | 0.1350 | -0.1452 |
| -0.0260 | 0.1370 | -0.2507 |
| 0.0114 | 0.1364 | 0.0134 |
| 0.0158 | -0.1350 | 0.1452 |
| -0.0310 | 0.3488 | -0.2720 |

| | | |
|---------|---------|---------|
| s29 = | s35 = | s41 = |
| 0.0213 | 0.0932 | 0.0221 |
| -0.0123 | -0.1107 | -0.1594 |
| -0.0193 | -0.3063 | -0.2754 |
| -0.0213 | -0.0932 | -0.0221 |
| 0.0123 | 0.1107 | 0.1594 |
| -0.0250 | -0.0921 | -0.2985 |

| | | |
|---------|---------|---------|
| s30 = | s36 = | s42 = |
| -0.1366 | -0.0132 | -0.0496 |
| -0.0033 | -0.1083 | -0.1548 |
| 0.1209 | -0.2058 | -0.2510 |
| 0.1366 | 0.0132 | 0.0496 |
| 0.0033 | 0.1083 | 0.1548 |
| -0.1328 | -0.1841 | -0.3064 |

>>

Lampiran 30 : Output Gaya Masing-Masing dari software Etabs pada Kasus Kerusakan 5

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C O L U M N F O R C E E N V E L O P E S

| STORY | No.Batang | ITEM | P | V2 | V3 | T | M2 | M3 |
|-------|-----------|-----------|---------|---------|--------|--------|--------|---------|
| LT6 | B39 | Min Value | -0,0409 | -0,1256 | 0,0000 | 0,0000 | 0,0000 | -0,2051 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0409 | -0,1256 | 0,0000 | 0,0000 | 0,0000 | 0,2470 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B40 | Min Value | 0,0134 | -0,1452 | 0,0000 | 0,0000 | 0,0000 | -0,2507 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0134 | -0,1452 | 0,0000 | 0,0000 | 0,0000 | 0,2720 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B41 | Min Value | -0,0221 | -0,1594 | 0,0000 | 0,0000 | 0,0000 | -0,2753 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0221 | -0,1594 | 0,0000 | 0,0000 | 0,0000 | 0,2985 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT6 | B42 | Min Value | 0,0496 | -0,1548 | 0,0000 | 0,0000 | 0,0000 | -0,2510 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0496 | -0,1548 | 0,0000 | 0,0000 | 0,0000 | 0,3064 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B35 | Min Value | -0,0932 | -0,1107 | 0,0000 | 0,0000 | 0,0000 | -0,3063 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0932 | -0,1107 | 0,0000 | 0,0000 | 0,0000 | 0,0921 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B36 | Min Value | 0,0132 | -0,1083 | 0,0000 | 0,0000 | 0,0000 | -0,2058 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0132 | -0,1083 | 0,0000 | 0,0000 | 0,0000 | 0,1841 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B37 | Min Value | -0,0325 | -0,1157 | 0,0000 | 0,0000 | 0,0000 | -0,2194 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0325 | -0,1157 | 0,0000 | 0,0000 | 0,0000 | 0,1970 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT5 | B38 | Min Value | 0,1124 | -0,1663 | 0,0000 | 0,0000 | 0,0000 | -0,4830 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,1124 | -0,1663 | 0,0000 | 0,0000 | 0,0000 | 0,1156 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B31 | Min Value | -0,1197 | 0,0396 | 0,0000 | 0,0000 | 0,0000 | -0,1549 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,1197 | 0,0396 | 0,0000 | 0,0000 | 0,0000 | -0,0125 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B32 | Min Value | 0,0126 | -0,0137 | 0,0000 | 0,0000 | 0,0000 | -0,0325 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0126 | -0,0137 | 0,0000 | 0,0000 | 0,0000 | 0,0167 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B33 | Min Value | -0,0293 | -0,0024 | 0,0000 | 0,0000 | 0,0000 | -0,0129 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0293 | -0,0024 | 0,0000 | 0,0000 | 0,0000 | -0,0044 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT4 | B34 | Min Value | 0,1364 | 0,1350 | 0,0000 | 0,0000 | 0,0000 | -0,3489 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,1364 | 0,1350 | 0,0000 | 0,0000 | 0,0000 | 0,1370 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B27 | Min Value | -0,1267 | 0,0274 | 0,0000 | 0,0000 | 0,0000 | 0,0269 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,1267 | 0,0274 | 0,0000 | 0,0000 | 0,0000 | 0,1254 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B28 | Min Value | 0,0114 | -0,0158 | 0,0000 | 0,0000 | 0,0000 | -0,0260 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | 0,0114 | -0,0158 | 0,0000 | 0,0000 | 0,0000 | 0,0310 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| LT3 | B29 | Min Value | -0,0213 | -0,0123 | 0,0000 | 0,0000 | 0,0000 | -0,0193 |
| | | Min Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |
| | | Max Value | -0,0213 | -0,0123 | 0,0000 | 0,0000 | 0,0000 | 0,0250 |
| | | Max Case | DEAD | DEAD | DEAD | DEAD | DEAD | DEAD |

