LAMPIRAN 1
HASIL PERHITUNGAN

7.1 HOSPITAL

Perhitungan nilai perpindahan peletakan Awal :

Examination Room dilokasi A

X-ray Room dilokasi B

Hematology Lab dilokasi C

Waiting Room dilokasi D

Medical Record dilokasi E

Perhitungan nilai perpindahan :

Dari Examination Room di lokasi A menuju X-ray Room di lokasi B (X1):

Jarak = 18

Frekuensi = 150

Nilai perpindahan = 18*150 = 2700

Dari Examination Room di lokasi A menuju Hematology Lab di lokasi C (X12):

Jarak = 28

Frekuensi = 130

Nilai perpindahan = 28*130 = 3640

Dari Examination Room di lokasi A menuju Waiting Room di lokasi D (X23):

Jarak = 10

Frekuensi = 230

Nilai perpindahan = 10*230 = 2300

Dari Examination Room di lokasi A menuju Medical Record di lokasi E (X34):

Jarak = 35

Frekuensi = 70

Nilai perpindahan = 35*70 = 2450

Dari X-ray Room di lokasi B menuju Hematology Lab di lokasi C (X45):

Jarak = 18

Frekuensi = 200

Nilai perpindahan = 18*200 = 3600

Dari X-ray Room di lokasi B menuju Waiting Room di lokasi D (X56):

Jarak = 15

Frekuensi = 0

Nilai perpindahan = 15*0 = 0

Dari X-ray Room di lokasi B menuju Medical Record di lokasi E (X67):

Jarak = 15

Frekuensi = 60

Nilai perpindahan = 15*60 = 900

Dari Hematology Lab di lokasi C menuju Waiting Room di lokasi D (X78):

Jarak = 35

Frekuensi = 180

Nilai perpindahan = 35*180 = 6300

Dari Hematology Lab di lokasi C menuju Medical Record di lokasi E (X89):

Jarak = 10

Frekuensi = 100

Nilai perpindahan = 10*100 = 1000

Dari Waiting Room di lokasi D menuju Medical Record di lokasi E (X100):

Jarak = 28

Frekuensi = 50

Nilai perpindahan = 28*50 = 1400

Total jarak perpindahan :

2700+3640+2300+2450+3600+0+900+6300+1000+1400 = 24290

7.2 MODEL 1

MATRIK U	12	13	23
AB	8	20	12
AC	4	10	6
BC	20	50	30

MATRIK V	12	13	23
AB	12	24	15
AC	16	32	20
BC	20	40	25

MATRIK S	12	13	23
BA	6	15	9
CA	8	20	12
CB	10	25	15

MATRIK T	12	13	23
BA	16	32	20
CA	8	16	10
CB	40	80	50

MATRIK M	12	13	23
AB	0	0	0
AC	0	0	0
BC	0	0	0

MATRIK K	12	13	23
AB	1	1	1
AC	1	1	1
BC	1	1	1

MATRIK N	
1	2
1	3
2	3

INDEX	1	2	3
MATRIK q	1	1	2
MATRIK r	2	3	3

Gambar 7.1 Matrik Bantu Perhitungan Model 1

7.2.1 MODEL LINEAR 1

= (20*Y11*Y22)+(44*Y11*Y32)+(27*Y21*Y32)+(20*Y11*Y23) +
(42*Y11*Y33) +(26*Y21*Y33) +(40*Y12*Y23) +(90*Y12*Y33) +
(55*Y22*Y33) +(22*Y21*Y12) +(47*Y31*Y12) +(29*Y31*Y22) +
(16*Y21*Y13)+(36*Y31*Y13) +(22*Y31*Y23) +(50*Y22*Y13) +
(105*Y32*Y13) +(65*Y32*Y23);

X11+X12+X13=1;
X21+X22+X23=1;
X31+X32+X33=1;
X11+X21+X31=1;
X12+X22+X32=1;
X13+X23+X33=1;
Y11+Y12+Y13=1;
Y21+Y22+Y23=1;
Y31+Y32+Y33=1;

```
Y11+Y21+Y31=1;
Y12+Y22+Y32=1;
Y13+Y23+Y33=1;
X11+X12+X21+X22-Y11=1;
X11+X13+X21+X23-Y21=1;
X12+X13+X22+X23-Y31=1;
X11+X12+X31+X32-Y12=1;
X11+X13+X31+X33-Y22=1;
X12+X13+X32+X33-Y32=1;
X21+X22+X31+X32-Y13=1;
X21+X23+X31+X33-Y23=1;
X22+X23+X32+X33-Y33=1;
@BIN (X11);                    @BIN (Y12);
@BIN (X12);                    @BIN (Y13);
@BIN (X13);                    @BIN (Y21);
@BIN (X21);                    @BIN (Y22);
@BIN (X22);                    @BIN (Y23);
@BIN (X23);                    @BIN (Y31);
@BIN (X31);                    @BIN (Y32);
@BIN (X32);                    @BIN (Y33);
@BIN (X33);                    END
@BIN (Y11);
```

7.2.2 HASIL LINGO MODEL 1

```
Local optimal solution found at iteration:          114
  Objective value:                                109.0000

                      Variable           Value        Reduced Cost
                           Y11        0.000000            0.000000
                           Y22        0.000000            0.000000
                           Y32        0.000000            0.000000
                           Y21        0.000000            0.000000
                           Y23        1.000000            0.000000
                           Y33        0.000000           -7.999938
                           Y12        1.000000            87.00003
                           Y31        1.000000            10.99999
                           Y13        0.000000            0.000000
                           X11        0.000000            0.000000
                           X12        1.000000            0.000000
                           X13        0.000000            3.000068
                           X21        0.000000            0.000000
                           X22        0.000000            0.000000
                           X23        1.000000            0.000000
                           X31        1.000000            0.000000
                           X32        0.000000            0.000000
                           X33        0.000000            27.00004
                           Row    Slack or Surplus      Dual rice
                             1        109.0000           -.000000
                             2        0.000000            15.99986
```

3	0.000000	18.99993
4	0.000000	-3.000068
5	0.000000	0.000000
6	0.000000	-15.99986
7	0.000000	0.000000
8	0.000000	0.000000
9	0.000000	-25.99996
10	0.000000	-53.99996
11	0.000000	-14.99997
12	0.000000	0.000000
13	0.000000	-35.99998
14	0.000000	0.000000
15	0.000000	-18.99993
16	0.000000	0.000000
17	0.000000	0.000000
18	0.000000	3.000068
19	0.000000	0.000000
20	0.000000	0.000000
21	0.000000	0.000000
22	0.000000	0.000000

7.2.3 HASIL PASCAL MODEL 1

Urutan Posisi Optimal : 2 3 1
Nilai Perhitungan : 109

7.2.4 PERHITUNGAN MANUAL MODEL 1

Urutan Peletakan	Nilai Perhitungan
123	117
132	129
213	138
231	**109**
312	148
321	115

Tabel 7.1 Perhitungan Manual Model 1

7.3 MODEL 2

MATRIK U	12	13	14	23	24	34
AB	10	35	25	25	15	20
AC	8	28	20	20	12	16
AD	4	14	10	10	6	8
BC	20	70	50	50	30	40
BD	4	14	10	10	6	8
CD	4	14	10	10	6	8

MATRIK V	12	13	14	23	24	34
AB	10	35	25	25	15	20
AC	8	28	20	20	12	16
AD	4	14	10	10	6	8
BC	20	70	50	50	30	40
BD	4	14	10	10	6	8
CD	4	14	10	10	6	8

MATRIK S	12	13	14	23	24	34
AB	10	35	25	25	15	20
AC	8	28	20	20	12	16
AD	4	14	10	10	6	8
BC	20	70	50	50	30	40
BD	4	14	10	10	6	8
CD	4	14	10	10	6	8

MATRIK T	12	13	14	23	24	34
AB	10	35	25	25	15	20
AC	8	28	20	20	12	16
AD	4	14	10	10	6	8
BC	20	70	50	50	30	40
BD	4	14	10	10	6	8
CD	4	14	10	10	6	8

MATRIK M	12	13	14	23	24	34
AB	0	0	0	0	0	0
AC	1	-1	-1	1	1	1
AD	-1	1	1	-1	-1	-1
BC	0	0	0	0	0	0
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK K	12	13	14	23	24	34
AB	1	1	1	1	1	1
AC	0	1	1	0	0	0
AD	1	0	0	1	1	1
BC	1	1	1	1	1	1
BD	1	1	1	1	1	1
CD	1	1	1	1	1	1

MATRIK N		
1	2	3
1	4	5
2	4	6
3	5	6

INDEX	1	2	3	4	5	6
MATRIK q	1	1	1	2	2	3
MATRIK r	2	3	4	3	4	4

Gambar 7.2 Matrik Bantu Perhitungan Model 2

7.3.1 MODEL LINEAR 2

MIN= (20*Y11*Y22) +(70*Y11*Y32) +(50*Y11*Y42) +(50*Y21*Y32)
+(30*Y21*Y42) +(40*Y31*Y42)
+(16*Y11*Y23) +(56*Y11*Y33) +(40*Y11*Y43) +(40*Y21*Y33)
+(24*Y21*Y43) +(32*Y31*Y43)
+(8*Y11*Y24) +(28*Y11*Y34) +(20*Y11*Y44) +(20*Y21*Y34)
+(12*Y21*Y44) +(16*Y31*Y44)
+(40*Y12*Y23) +(140*Y12*Y33) + (100*Y12*Y43) +(100*Y22*Y33)
+(60*Y22*Y43) +(80*Y32*Y43)
+(8*Y12*Y24) +(28*Y12*Y34) +(20*Y12*Y44) +(20*Y22*Y34)
+(12*Y22*Y44) +(16*Y32*Y44)
+(8*Y13*Y24) +(28*Y13*Y34) +(20*Y13*Y44) +(20*Y23*Y34)
+(12*Y23*Y44) +(16*Y33*Y44) +

(20*Y21*Y12) +(70*Y31*Y12) +(50*Y41*Y12) +(50*Y31*Y22)
+(30*Y41*Y22) +(40*Y41*Y32)
+(16*Y21*Y13) +(56*Y31*Y13) +(40*Y41*Y13) +(40*Y31*Y23)
+(24*Y41*Y23) +(32*Y41*Y33)
+(8*Y21*Y14) +(28*Y31*Y14) +(20*Y41*Y14) +(20*Y31*Y24)
+(12*Y41*Y24) +(16*Y41*Y34)
+(40*Y22*Y13) +(140*Y32*Y13) + (100*Y42*Y13) +(100*Y32*Y23)
+(60*Y42*Y23) +(80*Y42*Y33)
+(8*Y22*Y14) +(28*Y32*Y14) +(20*Y42*Y14) +(20*Y32*Y24)
+(12*Y42*Y24) +(16*Y42*Y34)
+(8*Y23*Y14) +(28*Y33*Y14) +(20*Y43*Y14) +(20*Y33*Y24)
+(12*Y43*Y24) +(16*Y43*Y34) ;

X11+X12+X13+X14+X15+X16=1;
X21+X22+X23+X24+X25+X26=1;
X31+X32+X33+X34+X35+X36=1;
X41+X42+X43+X44+X45+X46=1;
X51+X52+X53+X54+X55+X56=1;
X61+X62+X63+X64+X65+X66=1;

```
X11+X21+X31+X41+X51+X61=1;
X12+X22+X32+X42+X52+X62=1;
X13+X23+X33+X43+X53+X63=1;
X14+X24+X34+X44+X54+X64=1;
X15+X25+X35+X45+X55+X65=1;
X16+X26+X36+X46+X56+X66=1;
Y11+Y12+Y13+Y14=1;
Y21+Y22+Y23+Y24=1;
Y31+Y32+Y33+Y34=1;
Y41+Y42+Y43+Y44=1;
Y11+Y21+Y31+Y41=1;
Y12+Y22+Y32+Y42=1;
Y13+Y23+Y33+Y43=1;
Y14+Y24+Y34+Y44=1;
X11+X12+X13+X21+X22+X23+X31+X32+X33-2*Y11=1;
X11+X14+X15+X21+X24+X25+X31+X34+X35-2*Y21=1;
X12+X14+X16+X22+X24+X26+X32+X34+X36-2*Y31=1;
X13+X15+X16+X23+X25+X26+X33+X35+X36-2*Y41=1;
X11+X12+X13+X41+X42+X43+X51+X52+X53-2*Y12=1;
X11+X14+X15+X41+X44+X45+X51+X54+X55-2*Y22=1;
X12+X14+X16+X42+X44+X46+X52+X54+X56-2*Y32=1;
X13+X15+X16+X43+X45+X46+X53+X55+X56-2*Y42=1;
X21+X22+X23+X41+X42+X43+X61+X62+X63-2*Y13=1;
X21+X24+X25+X41+X44+X45+X61+X64+X65-2*Y23=1;
X22+X24+X26+X42+X44+X46+X62+X64+X66-2*Y33=1;
X23+X25+X26+X43+X45+X46+X63+X65+X66-2*Y43=1;
X31+X32+X33+X51+X52+X53+X61+X62+X63-2*Y14=1;
X31+X34+X35+X51+X54+X55+X61+X64+X65-2*Y24=1;
X32+X34+X36+X52+X54+X56+X62+X64+X66-2*Y34=1;
X33+X35+X36+X53+X55+X56+X63+X65+X66-2*Y44=1;
X21=0;                  @BIN (X25);          @BIN (X53);
X24=0;                  @BIN (X26);          @BIN (X54);
X25=0;                  @BIN (X31);          @BIN (X55);
X26=0;                  @BIN (X32);          @BIN (X56);
X32=0;                  @BIN (X33);          @BIN (X61);
X33=0;                  @BIN (X34);          @BIN (X62);
@BIN (X11);             @BIN (X35);          @BIN (X63);
@BIN (X12);             @BIN (X36);          @BIN (X64);
@BIN (X13);             @BIN (X41);          @BIN (X65);
@BIN (X14);             @BIN (X42);          @BIN (X66);
@BIN (X15);             @BIN (X43);          @BIN (Y11);
@BIN (X16);             @BIN (X44);          @BIN (Y12);
@BIN (X21);             @BIN (X45);          @BIN (Y13);
@BIN (X22);             @BIN (X46);          @BIN (Y14);
@BIN (X23);             @BIN (X51);          @BIN (Y21);
@BIN (X24);             @BIN (X52);          @BIN (Y22);
```

```
@BIN (Y23);   @BIN (Y33);   @BIN (Y43);
@BIN (Y24);   @BIN (Y34);   @BIN (Y44);
@BIN (Y31);   @BIN (Y41);   END
@BIN (Y32);   @BIN (Y42);
```

7.3.2 HASIL LINGO MODEL 2

```
Local optimal solution found at iteration:          258
Objective value:                                174.0000
```

Variable	Value	Reduced Cost
Y11	0.000000	0.000000
Y22	1.000000	0.000000
Y32	0.000000	45.99996
Y42	0.000000	13.99994
Y21	0.000000	0.000000
Y31	0.000000	25.99997
Y23	0.000000	0.000000
Y33	0.000000	0.3065859E-04
Y43	0.000000	0.000000
Y24	0.000000	0.000000
Y34	1.000000	0.000000
Y44	0.000000	0.000000
Y12	0.000000	0.000000
Y13	1.000000	7.999930
Y41	1.000000	14.00000
Y14	0.000000	16.00004
X11	0.000000	0.000000
X12	0.000000	0.000000
X13	0.000000	11.99998
X14	0.000000	0.000000
X15	1.000000	23.99995
X16	0.000000	1.999952
X21	0.000000	0.000000
X22	0.000000	0.000000
X23	1.000000	0.000000
X24	0.000000	0.000000
X25	0.000000	0.000000
X26	0.000000	0.000000
X31	0.000000	0.000000
X32	0.000000	0.000000
X33	0.000000	0.000000
X34	0.000000	-1.999952
X35	0.000000	22.00000
X36	1.000000	0.000000
X41	1.000000	0.000000
X42	0.000000	22.00000
X43	0.000000	10.00002
X44	0.000000	0.000000
X45	0.000000	0.000000
X46	0.000000	0.000000
X51	0.000000	0.000000
X52	0.000000	0.000000
X53	0.000000	0.000000

X54	1.000000	10.00002
X55	0.000000	22.00000
X56	0.000000	0.000000
X61	0.000000	1.999952
X62	1.000000	23.99995
X63	0.000000	11.99998
X64	0.000000	0.000000
X65	0.000000	0.000000
X66	0.000000	0.000000
Row	Slack or Surplus	Dual rice
1	174.0000	-.000000
2	0.000000	1.999952
3	0.000000	-49.99999
4	0.000000	0.000000
5	0.000000	0.000000
6	0.000000	27.99999
7	0.000000	0.000000
8	0.000000	-34.00000
9	0.000000	0.000000
10	0.000000	0.000000
11	0.000000	-23.99997
12	0.000000	-12.00000
13	0.000000	0.000000
14	0.000000	-24.00001
15	0.000000	0.000000
16	0.000000	-78.00000
17	0.000000	-46.00000
18	0.000000	0.000000
19	0.000000	-70.00000
20	0.000000	-28.00003
21	0.000000	0.000000
22	0.000000	12.00001
23	0.000000	18.00001
24	0.000000	1.000010
25	0.000000	12.99999
26	0.000000	-7.999975
27	0.000000	10.00000
28	0.000000	-6.999999
29	0.000000	-6.999999
30	0.000000	23.99999
31	0.000000	7.999985
32	0.000000	12.99999
33	0.000000	1.000010
34	0.000000	-6.000022
35	0.000000	10.00000
36	0.000000	-6.999999
37	0.000000	-6.999999
38	0.000000	22.00000
39	0.000000	33.99998
40	0.000000	22.00000
41	0.000000	22.00000
42	0.000000	0.000000
43	0.000000	-11.99998

7.3.3 HASIL PASCAL MODEL 1

Urutan Posisi Optimal : 3 2 4 1
Nilai Perhitungan : 174

7.3.4 PERHITUNGAN MANUAL MODEL 1

Urutan Peletakan	Nilai Perhitungan	Pembatas
1234	224	d14
1243	184	d14
1324	234	j13
1342	190	j13
1423	230	j13,d14
1432	226	
2134	248	j13
2143	208	j13
2314	198	j13
2341	178	j13
2413	242	j13
2431	262	j13
3124	254	j13
3142	210	j13
3214	194	
3241	**174**	
3412	236	
3421	260	j13,d14
4123	210	j13
4132	206	j13
4213	198	j13
4231	218	j13,d14
4312	196	j13
4321	220	j13,d14

Tabel 7.2 Perhitungan Manual Model 2

7.4 MODEL 3

MATRIK U	12	13	14	23	24	34
AB	6	12	6	15	6	12
AC	4	8	4	10	4	8
AD	0	0	0	0	0	0
BC	14	28	14	35	14	28
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK V	12	13	14	23	24	34
AB	6	9	9	15	9	12
AC	4	6	6	10	6	8
AD	0	0	0	0	0	0
BC	14	21	21	35	21	28
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK S	12	13	14	23	24	34
AB	6	12	6	15	6	12
AC	4	8	4	10	4	8
AD	0	0	0	0	0	0
BC	14	28	14	35	14	28
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK T	12	13	14	23	24	34
AB	6	9	9	15	9	12
AC	4	6	6	10	6	8
AD	0	0	0	0	0	0
BC	14	21	21	35	21	28
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK M	12	13	14	23	24	34
AB	0	0	0	0	0	0
AC	0	0	0	0	0	0
AD	0	0	0	0	0	0
BC	0	0	0	0	0	0
BD	0	0	0	0	0	0
CD	0	0	0	0	0	0

MATRIK K	12	13	14	23	24	34
AB	1	1	1	1	1	1
AC	1	1	1	1	1	1
AD	1	1	1	1	1	1
BC	1	1	1	1	1	1
BD	1	1	1	1	1	1
CD	1	1	1	1	1	1

MATRIK N		
1	2	3
1	4	5
2	4	6
3	5	6

INDEX	1	2	3	4	5	6
MATRIK q	1	1	1	2	2	3
MATRIK r	2	3	4	3	4	4

Gambar 7.3 Matrik Bantu Perhitungan Model 3

7.4.1 MODEL LINEAR 3

MIN= (12*Y11*Y22) +(21*Y11*Y32) +(15*Y11*Y42) +(30*Y21*Y32)
+(15*Y21*Y42) +(24*Y31*Y42)
+(8*Y11*Y23) +(14*Y11*Y33) +(10*Y11*Y43) +(20*Y21*Y33)
+(10*Y21*Y43) +(16*Y31*Y43)
+(28*Y12*Y23) +(49*Y12*Y33) + (35*Y12*Y43) +(70*Y22*Y33)
+(35*Y22*Y43) +(56*Y32*Y43)

+(12*Y21*Y12) +(21*Y31*Y12) +(15*Y41*Y12) +(30*Y31*Y22)
+(15*Y41*Y22) +(24*Y41*Y32)
+(8*Y21*Y13) +(14*Y31*Y13) +(10*Y41*Y13) +(20*Y31*Y23)
+(10*Y41*Y23) +(16*Y41*Y33)
+(28*Y22*Y13) +(49*Y32*Y13) + (35*Y42*Y13) +(70*Y32*Y23)
+(35*Y42*Y23) +(56*Y42*Y33);

X11+X12+X13+X14+X15+X16=1;
X21+X22+X23+X24+X25+X26=1;
X31+X32+X33+X34+X35+X36=1;
X41+X42+X43+X44+X45+X46=1;
X51+X52+X53+X54+X55+X56=1;
X61+X62+X63+X64+X65+X66=1;
X11+X21+X31+X41+X51+X61=1;
X12+X22+X32+X42+X52+X62=1;
X13+X23+X33+X43+X53+X63=1;
X14+X24+X34+X44+X54+X64=1;
X15+X25+X35+X45+X55+X65=1;
X16+X26+X36+X46+X56+X66=1;
Y11+Y12+Y13+Y14=1;
Y21+Y22+Y23+Y24=1;
Y31+Y32+Y33+Y34=1;
Y41+Y42+Y43+Y44=1;
Y11+Y21+Y31+Y41=1;

```
Y12+Y22+Y32+Y42=1;
Y13+Y23+Y33+Y43=1;
Y14+Y24+Y34+Y44=1;
X11+X12+X13+X21+X22+X23+X31+X32+X33-2*Y11=1;
X11+X14+X15+X21+X24+X25+X31+X34+X35-2*Y21=1;
X12+X14+X16+X22+X24+X26+X32+X34+X36-2*Y31=1;
X13+X15+X16+X23+X25+X26+X33+X35+X36-2*Y41=1;
X11+X12+X13+X41+X42+X43+X51+X52+X53-2*Y12=1;
X11+X14+X15+X41+X44+X45+X51+X54+X55-2*Y22=1;
X12+X14+X16+X42+X44+X46+X52+X54+X56-2*Y32=1;
X13+X15+X16+X43+X45+X46+X53+X55+X56-2*Y42=1;
X21+X22+X23+X41+X42+X43+X61+X62+X63-2*Y13=1;
X21+X24+X25+X41+X44+X45+X61+X64+X65-2*Y23=1;
X22+X24+X26+X42+X44+X46+X62+X64+X66-2*Y33=1;
X23+X25+X26+X43+X45+X46+X63+X65+X66-2*Y43=1;
X31+X32+X33+X51+X52+X53+X61+X62+X63-2*Y14=1;
X31+X34+X35+X51+X54+X55+X61+X64+X65-2*Y24=1;
X32+X34+X36+X52+X54+X56+X62+X64+X66-2*Y34=1;
X33+X35+X36+X53+X55+X56+X63+X65+X66-2*Y44=1;

@BIN (X11);   @BIN (X41);   @BIN (Y11);
@BIN (X12);   @BIN (X42);   @BIN (Y12);
@BIN (X13);   @BIN (X43);   @BIN (Y13);
@BIN (X14);   @BIN (X44);   @BIN (Y14);
@BIN (X15);   @BIN (X45);   @BIN (Y21);
@BIN (X16);   @BIN (X46);   @BIN (Y22);
@BIN (X21);   @BIN (X51);   @BIN (Y23);
@BIN (X22);   @BIN (X52);   @BIN (Y24);
@BIN (X23);   @BIN (X53);   @BIN (Y31);
@BIN (X24);   @BIN (X54);   @BIN (Y32);
@BIN (X25);   @BIN (X55);   @BIN (Y33);
@BIN (X26);   @BIN (X56);   @BIN (Y34);
@BIN (X31);   @BIN (X61);   @BIN (Y41);
@BIN (X32);   @BIN (X62);   @BIN (Y42);
@BIN (X33);   @BIN (X63);   @BIN (Y43);
@BIN (X34);   @BIN (X64);   @BIN (Y44);
@BIN (X35);   @BIN (X65);   END
@BIN (X36);   @BIN (X66);
```

7.4.2 HASIL LINGO MODEL 3

```
Local optimal solution found at iteration:          986
Objective value:                                53.00000

                     Variable           Value        Reduced Cost
                           Y11        0.000000            0.000000
```

Y22	1.000000	31.99994
Y32	0.000000	41.00000
Y42	0.000000	6.999968
Y21	0.000000	0.000000
Y31	0.000000	15.00000
Y23	0.000000	-7.999976
Y33	0.000000	46.99999
Y43	0.000000	0.000000
Y12	0.000000	0.000000
Y41	1.000000	0.000000
Y13	1.000000	15.99998
X11	0.000000	0.000000
X12	0.000000	1.999996
X13	0.000000	0.000000
X14	0.000000	0.000000
X15	1.000000	0.000000
X16	0.000000	8.499998
X21	0.000000	0.000000
X22	0.000000	1.999996
X23	1.000000	0.000000
X24	0.000000	0.000000
X25	0.000000	0.000000
X26	0.000000	8.499998
X31	0.000000	8.499998
X32	0.000000	0.000000
X33	0.000000	0.000000
X34	0.000000	0.000000
X35	0.000000	1.999996
X36	1.000000	0.000000
X41	1.000000	0.000000
X42	0.000000	1.999996
X43	0.000000	0.000000
X44	0.000000	0.000000
X45	0.000000	0.000000
X46	0.000000	8.499998
X51	0.000000	8.499998
X52	0.000000	0.000000
X53	0.000000	0.000000
X54	1.000000	0.000000
X55	0.000000	1.999996
X56	0.000000	0.000000
X61	0.000000	8.499998
X62	1.000000	0.000000
X63	0.000000	0.000000
X64	0.000000	0.000000
X65	0.000000	1.999996
X66	0.000000	0.000000
Y14	0.000000	0.000000
Y24	0.000000	0.000000
Y34	1.000000	0.000000
Y44	0.000000	0.000000

Row	Slack or Surplus	Dual rice
1	53.00000	-1.000000
2	0.000000	-3.999992
3	0.000000	-3.99999
4	0.000000	-10.49999

5	0.000000	13.00000
6	0.000000	6.500002
7	0.000000	6.500002
8	0.000000	17.00000
9	0.000000	1.999996
10	0.000000	0.000000
11	0.000000	3.999992
12	0.000000	3.999992
13	0.000000	-4.500006
14	0.000000	0.000000
15	0.000000	0.000000
16	0.000000	-3.999992
17	0.000000	0.000000
18	0.000000	-8.000004
19	0.000000	-28.00003
20	0.000000	-35.00000
21	0.000000	0.000000
22	0.000000	1.999996
23	0.000000	0.000000
24	0.000000	8.499998
25	0.000000	8.499998
26	0.000000	-6.500002
27	0.000000	-8.499998
28	0.000000	0.000000
29	0.000000	0.000000
30	0.000000	-6.500002
31	0.000000	-8.499998
32	0.000000	0.000000
33	0.000000	0.000000
34	0.000000	0.000000
35	0.000000	0.000000
36	0.000000	-1.999996
37	0.000000	0.000000

7.4.3 HASIL PASCAL MODEL 3

Urutan Posisi Optimal : 3 2 4 1
Nilai Perhitungan : 53

7.4.4 PERHITUNGAN MANUAL MODEL 3

Urutan Peletakan	Nilai Perhitungan
1234	96
1243	57
1324	99
1342	58
1423	87
1432	85
2134	81
2143	57
2314	69
2341	53
2413	72
2431	80
3124	87
3142	58
3214	72
3241	53
3412	73
3421	83
4123	**96**
4132	91
4213	81
4231	101
4312	79
4321	104

Tabel 7.3 Perhitungan Manual Model 3

7.5 MODEL 4

MATRIK U	12	13	14	15	23	24	25	34	35	45
AB	9	9	6	21	3	12	15	6	9	18
AC	3	3	2	7	1	4	5	2	3	6
AD	6	6	4	14	2	8	10	4	6	12
AE	18	18	12	42	6	24	30	12	18	36
BC	6	6	4	14	2	8	10	4	6	12
BD	9	9	6	21	3	12	15	6	9	18
BE	9	9	6	21	3	12	15	6	9	18
CD	3	3	2	7	1	4	5	2	3	6
CE	3	3	2	7	1	4	5	2	3	6
DE	12	12	8	28	4	16	20	8	12	24

MATRIK V	12	13	14	15	23	24	25	34	35	45
AB	9	9	6	21	3	12	15	6	9	18
AC	3	3	2	7	1	4	5	2	3	6
AD	6	6	4	14	2	8	10	4	6	12
AE	18	18	12	42	6	24	30	12	18	36
BC	6	6	4	14	2	8	10	4	6	12
BD	9	9	6	21	3	12	15	6	9	18
BE	9	9	6	21	3	12	15	6	9	18
CD	3	3	2	7	1	4	5	2	3	6
CE	3	3	2	7	1	4	5	2	3	6
DE	12	12	8	28	4	16	20	8	12	24

MATRIK S	12	13	14	15	23	24	25	34	35	45
AB	9	9	6	21	3	12	15	6	9	18
AC	3	3	2	7	1	4	5	2	3	6
AD	6	6	4	14	2	8	10	4	6	12
AE	18	18	12	42	6	24	30	12	18	36
BC	6	6	4	14	2	8	10	4	6	12
BD	9	9	6	21	3	12	15	6	9	18
BE	9	9	6	21	3	12	15	6	9	18
CD	3	3	2	7	1	4	5	2	3	6
CE	3	3	2	7	1	4	5	2	3	6
DE	12	12	8	28	4	16	20	8	12	24

MATRIK T	12	13	14	15	23	24	25	34	35	45
AB	9	9	6	21	3	12	15	6	9	18
AC	3	3	2	7	1	4	5	2	3	6
AD	6	6	4	14	2	8	10	4	6	12
AE	18	18	12	42	6	24	30	12	18	36
BC	6	6	4	14	2	8	10	4	6	12
BD	9	9	6	21	3	12	15	6	9	18
BE	9	9	6	21	3	12	15	6	9	18
CD	3	3	2	7	1	4	5	2	3	6
CE	3	3	2	7	1	4	5	2	3	6
DE	12	12	8	28	4	16	20	8	12	24

MATRIK M	12	13	14	15	23	24	25	34	35	45
AB	0	0	0	0	0	0	0	0	0	0
AC	0	0	0	0	0	0	0	0	0	0
AD	1	1	-1	-1	-1	-1	-1	1	1	1
AE	0	0	0	0	0	0	0	0	0	0
BC	0	0	0	0	0	0	0	0	0	0
BD	1	1	-1	-1	-1	-1	-1	1	1	1
BE	0	0	0	0	0	0	0	0	0	0
CD	0	0	0	0	0	0	0	0	0	0
CE	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0

MATRIK K	12	13	14	15	23	24	25	34	35	45
AB	1	1	1	1	1	1	1	1	1	1
AC	1	1	1	1	1	1	1	1	1	1
AD	0	0	1	1	1	1	1	0	0	0
AE	1	1	1	1	1	1	1	1	1	1
BC	1	1	1	1	1	1	1	1	1	1
BD	0	0	1	1	1	1	1	0	0	0
BE	1	1	1	1	1	1	1	1	1	1
CD	1	1	1	1	1	1	1	1	1	1
CE	1	1	1	1	1	1	1	1	1	1
DE	1	1	1	1	1	1	1	1	1	1

MATRIK N			
1	2	3	4
1	5	6	7
2	5	8	9
3	6	8	10
4	7	9	10

INDEX	1	2	3	4	5	6	7	8	9	10
MATRIK q	1	1	1	1	2	2	2	3	3	4
MATRIK r	2	3	4	5	3	4	5	4	5	5

Gambar 7.4 Matrik Bantu Perhitungan Model 4

7.5.1 MODEL LINEAR 4

MIN=(18*Y11*Y22)+(18*Y11*Y32)+(12*Y11*Y42)+(42*Y11*Y52)+(6*Y21*Y32)+(24*Y21*Y42)+(30*Y21*Y52)+(12*Y31*Y42)+(18*Y31*Y52)+(36*Y41*Y52)+
(6*Y11*Y23)+(6*Y11*Y33)+(4*Y11*Y43)+(14*Y11*Y53)+(2*Y21*Y33)+(8*Y21*Y43)+(10*Y21*Y53)+(4*Y31*Y43)+(6*Y31*Y53)+(12*Y41*Y53)+

```
(12*Y11*Y24)+(12*Y11*Y34)+(8*Y11*Y44)+(28*Y11*Y54)+(4*Y21*Y34)+(
16*Y21*Y44)+(20*Y21*Y54)+(8*Y31*Y44)+(12*Y31*Y54)+(24*Y41*Y54)+
(36*Y11*Y25)+(36*Y11*Y35)+(24*Y11*Y45)+(84*Y11*Y55)+(12*Y21*Y35)
+(48*Y21*Y45)+(60*Y21*Y55)+(24*Y31*Y45)+(36*Y31*Y55)+(72*Y41*Y55
)+
(12*Y12*Y23)+(12*Y12*Y33)+(8*Y12*Y43)+(28*Y12*Y53)+(4*Y22*Y33)+(
16*Y22*Y43)+(20*Y22*Y53)+(8*Y32*Y43)+(12*Y32*Y53)+(24*Y42*Y53)+
(18*Y12*Y24)+(18*Y12*Y34)+(12*Y12*Y44)+(42*Y12*Y54)+(6*Y22*Y34)+
(24*Y22*Y44)+(30*Y22*Y54)+(12*Y32*Y44)+(18*Y32*Y54)+(36*Y42*Y54)
+
(18*Y12*Y25)+(18*Y12*Y35)+(12*Y12*Y45)+(42*Y12*Y55)+(6*Y22*Y35)+
(24*Y22*Y45)+(30*Y22*Y55)+(12*Y32*Y45)+(18*Y32*Y55)+(36*Y42*Y55)
+
(6*Y13*Y24)+(6*Y13*Y34)+(4*Y13*Y44)+(14*Y13*Y54)+(2*Y23*Y34)+(8*
Y23*Y44)+(10*Y23*Y54)+(4*Y33*Y44)+(6*Y33*Y54)+(12*Y43*Y54)+
(6*Y13*Y25)+(6*Y13*Y35)+(4*Y13*Y45)+(14*Y13*Y55)+(2*Y23*Y35)+(8*
Y23*Y45)+(10*Y23*Y55)+(4*Y33*Y45)+(6*Y33*Y55)+(12*Y43*Y55)+
(24*Y14*Y25)+(24*Y14*Y35)+(16*Y14*Y45)+(56*Y14*Y55)+(8*Y24*Y35)+
(32*Y24*Y45)+(40*Y24*Y55)+(16*Y34*Y45)+(24*Y34*Y55)+(48*Y44*Y55)
+

(18*Y21*Y12)+(18*Y31*Y12)+(12*Y41*Y12)+(42*Y51*Y12)+(6*Y31*Y22)+
(24*Y41*Y22)+(30*Y51*Y22)+(12*Y41*Y32)+(18*Y51*Y32)+(36*Y51*Y42)
+
(6*Y21*Y13)+(6*Y31*Y13)+(4*Y41*Y13)+(14*Y51*Y13)+(2*Y31*Y23)+(8*
Y41*Y23)+(10*Y51*Y23)+(4*Y41*Y33)+(6*Y51*Y33)+(12*Y51*Y43)+
(12*Y21*Y14)+(12*Y31*Y14)+(8*Y41*Y14)+(28*Y51*Y14)+(4*Y31*Y24)+(
16*Y41*Y24)+(20*Y51*Y24)+(8*Y41*Y34)+(12*Y51*Y34)+(24*Y51*Y44)+
(36*Y21*Y15)+(36*Y31*Y15)+(24*Y41*Y15)+(84*Y51*Y15)+(12*Y31*Y25)
+(48*Y41*Y25)+(60*Y51*Y25)+(24*Y41*Y35)+(36*Y51*Y35)+(72*Y51*Y45
)+
(12*Y22*Y13)+(12*Y32*Y13)+(8*Y42*Y13)+(28*Y52*Y13)+(4*Y32*Y23)+(
16*Y42*Y23)+(20*Y52*Y23)+(8*Y42*Y33)+(12*Y52*Y33)+(24*Y52*Y43)+
(18*Y22*Y14)+(18*Y32*Y14)+(12*Y42*Y14)+(42*Y52*Y14)+(6*Y32*Y24)+
(24*Y42*Y24)+(30*Y52*Y24)+(12*Y42*Y34)+(18*Y52*Y34)+(36*Y52*Y44)
+
(18*Y22*Y15)+(18*Y32*Y15)+(12*Y42*Y15)+(42*Y52*Y15)+(6*Y32*Y25)+
(24*Y42*Y25)+(30*Y52*Y25)+(12*Y42*Y35)+(18*Y52*Y35)+(36*Y52*Y45)
+
(6*Y23*Y14)+(6*Y33*Y14)+(4*Y43*Y14)+(14*Y53*Y14)+(2*Y33*Y24)+(8*
Y43*Y24)+(10*Y53*Y24)+(4*Y43*Y34)+(6*Y53*Y34)+(12*Y53*Y44)+
(6*Y23*Y15)+(6*Y33*Y15)+(4*Y43*Y15)+(14*Y53*Y15)+(2*Y33*Y25)+(8*
Y43*Y25)+(10*Y53*Y25)+(4*Y43*Y35)+(6*Y53*Y35)+(12*Y53*Y45)+
(24*Y24*Y15)+(24*Y34*Y15)+(16*Y44*Y15)+(56*Y54*Y15)+(8*Y34*Y25)+
(32*Y44*Y25)+(40*Y54*Y25)+(16*Y44*Y35)+(24*Y54*Y35)+(48*Y54*Y45)
;
```

```
X11+X12+X13+X14+X15+X16+X17+X18+X19+X110=1;
X21+X22+X23+X24+X25+X26+X27+X28+X29+X210=1;
X31+X32+X33+X34+X35+X36+X37+X38+X39+X310=1;
X41+X42+X43+X44+X45+X46+X47+X48+X49+X410=1;
X51+X52+X53+X54+X55+X56+X57+X58+X59+X510=1;
X61+X62+X63+X64+X65+X66+X67+X68+X69+X610=1;
X71+X72+X73+X74+X75+X76+X77+X78+X79+X710=1;
X81+X82+X83+X84+X85+X86+X87+X88+X89+X810=1;
X91+X92+X93+X94+X95+X96+X97+X98+X99+X910=1;
X101+X102+X103+X104+X105+X106+X107+X108+X109+X1010=1;
X11+X21+X31+X41+X51+X61+X71+X81+X91+X101=1;
X12+X22+X32+X42+X52+X62+X72+X82+X92+X102=1;
X13+X23+X33+X43+X53+X63+X73+X83+X93+X103=1;
X14+X24+X34+X44+X54+X64+X74+X84+X94+X104=1;
X15+X25+X35+X45+X55+X65+X75+X85+X95+X105=1;
X16+X26+X36+X46+X56+X66+X76+X86+X96+X106=1;
X17+X27+X37+X47+X57+X67+X77+X87+X97+X107=1;
X18+X28+X38+X48+X58+X68+X78+X88+X98+X108=1;
X19+X29+X39+X49+X59+X69+X79+X89+X99+X109=1;
X110+X210+X310+X410+X510+X610+X710+X810+X910+X1010=1;
Y11+Y12+Y13+Y14+Y15=1;
Y21+Y22+Y23+Y24+Y25=1;
Y31+Y32+Y33+Y34+Y35=1;
Y41+Y42+Y43+Y44+Y45=1;
Y51+Y52+Y53+Y54+Y55=1;
Y11+Y21+Y31+Y41+Y51=1;
Y12+Y22+Y32+Y42+Y52=1;
Y13+Y23+Y33+Y43+Y53=1;
Y14+Y24+Y34+Y44+Y54=1;
Y15+Y25+Y35+Y45+Y55=1;
X11+X12+X13+X14+X21+X22+X23+X44+X31+X32+X33+X34+
X41+X42+X43+X44-3*Y11=1;
X11+X15+X16+X17+X21+X25+X26+X47+X31+X35+X36+X37+
X41+X45+X46+X47-3*Y21=1;
X12+X15+X18+X19+X22+X25+X28+X49+X32+X35+X38+X39+
X42+X45+X48+X49-3*Y31=1;
X13+X16+X18+X110+X23+X26+X28+X410+X33+X36+X38+
X310+X43+X46+X48+X410-3*Y41=1;
X14+X17+X19+X110+X24+X27+X29+X410+X34+X37+X39+
X310+X44+X47+X49+X410-3*Y51=1;
X11+X12+X13+X14+X51+X52+X53+X54+X61+X62+X63+X64+
X71+X72+X73+X74-3*Y12=1;
X11+X15+X16+X17+X51+X55+X56+X57+X61+X65+X66+X67+
X71+X75+X76+X77-3*Y22=1;
```

```
X12+X15+X18+X19+X52+X55+X58+X59+X62+X65+X68+X69+
X72+X75+X78+X79-3*Y32=1;
X13+X16+X18+X110+X53+X56+X58+X510+X63+X66+X68+
X610+X73+X76+X78+X710-3*Y42=1;
X14+X17+X19+X110+X54+X57+X59+X510+X64+X67+X69+
X610+X74+X77+X79+X710-3*Y52=1;
X21+X22+X23+X24+X51+X52+X53+X54+X81+X82+X83+X84+
X91+X92+X93+X94-3*Y13=1;
X21+X25+X26+X27+X51+X55+X56+X57+X81+X85+X86+X87+
X91+X95+X96+X97-3*Y23=1;
X22+X25+X28+X29+X52+X55+X58+X59+X82+X85+X88+X89+
X92+X95+X98+X99-3*Y33=1;
X23+X26+X28+X210+X53+X56+X58+X510+X83+X86+X88+
X810+X93+X96+X98+X910-3*Y43=1;
X24+X27+X29+X210+X54+X57+X59+X510+X84+X87+X89+
X810+X94+X97+X99+X910-3*Y53=1;
X41+X42+X43+X44+X71+X72+X73+X74+X91+X92+X93+X94+
X101+X102+X103+X104-3*Y15=1;
X41+X45+X46+X47+X71+X75+X76+X77+X1+X95+X96+X97+
X101+X105+X106+X107-3*Y25=1;
X41+X45+X48+X49+X72+X75+X78+X79+X92+X95+X98+X99+
X102+X105+X108+X109-3*Y35=1;
X43+X46+X48+X410+X73+X76+X78+X710+X93+X96+X98+
X910+X103+X106+X108+X1010-3*Y45=1;
X44+X47+X49+X410+X74+X77+X79+X710+X94+X97+X99+
X910+X104+X107+X109+X1010-3*Y55=1;
X31=0;                  @BIN (X17);     @BIN (X37);
X32=0;                  @BIN (X18);     @BIN (X38);
X38=0;                  @BIN (X19);     @BIN (X39);
X39=0;                  @BIN (X110);    @BIN (X310);
X310=0;                 @BIN (X21);     @BIN (X41);
X61=0;                  @BIN (X22);     @BIN (X42);
X62=0;                  @BIN (X23);     @BIN (X43);
X68=0;                  @BIN (X24);     @BIN (X44);
X69=0;                  @BIN (X25);     @BIN (X45);
X610=0;                 @BIN (X26);     @BIN (X46);
Y31=0;                  @BIN (X27);     @BIN (X47);
Y32=0;                  @BIN (X28);     @BIN (X48);
Y34=0;                  @BIN (X29);     @BIN (X49);
Y35=0;                  @BIN (X210);    @BIN (X410);
@BIN (X11);             @BIN (X31);     @BIN (X51);
@BIN (X12);             @BIN (X32);     @BIN (X52);
@BIN (X13);             @BIN (X33);     @BIN (X53);
@BIN (X14);             @BIN (X34);     @BIN (X54);
@BIN (X15);             @BIN (X35);     @BIN (X55);
@BIN (X16);             @BIN (X36);     @BIN (X56);
```

```
@BIN (X57);
@BIN (X58);
@BIN (X59);
@BIN (X510);
@BIN (X61);
@BIN (X62);
@BIN (X63);
@BIN (X64);
@BIN (X65);
@BIN (X66);
@BIN (X67);
@BIN (X68);
@BIN (X69);
@BIN (X610);
@BIN (X71);
@BIN (X72);
@BIN (X73);
@BIN (X74);
@BIN (X75);
@BIN (X76);
@BIN (X77);
@BIN (X78);
@BIN (X79);
@BIN (X710);
@BIN (X81);
@BIN (X82);
@BIN (X83);
@BIN (X84);
@BIN (X85);
@BIN (X86);
@BIN (X87);
@BIN (X88);
@BIN (X89);
@BIN (X810);
@BIN (X91);
@BIN (X92);
@BIN (X93);
@BIN (X94);
@BIN (X95);
@BIN (X96);
@BIN (X97);
@BIN (X98);
@BIN (X99);
@BIN (X910);
@BIN (X101);
@BIN (X102);
@BIN (X103);
@BIN (X104);
@BIN (X105);
@BIN (X106);
@BIN (X107);
@BIN (X108);
@BIN (X109);
@BIN (X1010);
@BIN (Y11);
@BIN (Y12);
@BIN (Y13);
@BIN (Y14);
@BIN (Y15);
@BIN (Y21);
@BIN (Y22);
@BIN (Y23);
@BIN (Y24);
@BIN (Y25);
@BIN (Y31);
@BIN (Y32);
@BIN (Y33);
@BIN (Y34);
@BIN (Y35);
@BIN (Y41);
@BIN (Y42);
@BIN (Y43);
@BIN (Y44);
@BIN (Y45);
@BIN (Y51);
@BIN (Y52);
@BIN (Y53);
@BIN (Y54);
@BIN (Y55);
END
```

7.5.2 HASIL LINGO MODEL 4

```
Local optimal solution found at iteration:          1303
Objective value:                                  192.0000

                     Variable           Value        Reduced Cost
                          Y11        1.000000            13.49996
                          Y22        1.000000            3.500019
                          Y32        0.000000            0.000000
                          Y42        0.000000            0.000000
                          Y52        0.000000            0.000000
                          Y21        0.000000            0.000000
                          Y31        0.000000            0.000000
                          Y41        0.000000            0.000000
                          Y23        0.000000            0.000000
                          Y33        1.000000            0.000000
                          Y43        0.000000            21.50002
                          Y53        0.000000            0.000000
                          Y24        0.000000            0.000000
                          Y34        0.000000            0.000000
                          Y44        0.000000           0.5001276
```

Y54	1.000000	41.00004
Y25	0.000000	0.000000
Y35	0.000000	0.000000
Y45	1.000000	28.00012
Y55	0.000000	12.50017
Y12	0.000000	0.9999539
Y13	0.000000	14.99989
Y14	0.000000	0.000000
Y51	0.000000	16.00003
Y15	0.000000	2.000058
X11	1.000000	1.999956
X12	0.000000	1.499967
X13	0.000000	0.000000
X14	0.000000	0.4999891
X15	0.000000	2.499945
X16	0.000000	1.499967
X17	0.000000	0.000000
X18	0.000000	0.000000
X19	0.000000	0.000000
X110	0.000000	0.000000
X21	0.000000	2.499945
X22	1.000000	0.000000
X23	0.000000	0.9999782
X24	0.000000	1.499967
X25	0.000000	0.000000
X26	0.000000	1.499967
X27	0.000000	0.4999891
X28	0.000000	-1.999956
X29	0.000000	0.000000
X210	0.000000	3.499924
X31	0.000000	0.000000
X32	0.000000	0.000000
X33	0.000000	-1.999956
X34	1.000000	0.000000
X35	0.000000	0.000000
X36	0.000000	0.000000
X37	0.000000	0.000000
X38	0.000000	0.000000
X39	0.000000	0.000000
X310	0.000000	0.000000
X41	0.000000	0.000000
X42	0.000000	0.000000
X43	1.000000	0.000000
X44	0.000000	2.499945
X45	0.000000	0.000000
X46	0.000000	0.000000
X47	0.000000	0.000000
X48	0.000000	0.000000
X49	0.000000	0.000000
X410	0.000000	0.000000
X51	0.000000	4.499902
X52	0.000000	2.499945
X53	0.000000	2.499945
X54	0.000000	1.499967
X55	1.000000	2.499945
X56	0.000000	2.999934

X57	0.000000	0.000000
X58	0.000000	0.000000
X59	0.000000	-1.499967
X510	0.000000	0.000000
X61	0.000000	0.000000
X62	0.000000	0.000000
X63	0.000000	0.000000
X64	0.000000	0.000000
X65	0.000000	2.999934
X66	0.000000	1.999956
X67	1.000000	0.000000
X68	0.000000	0.000000
X69	0.000000	0.000000
X610	0.000000	0.000000
X71	0.000000	0.000000
X72	0.000000	1.499967
X73	0.000000	0.000000
X74	0.000000	0.000000
X75	0.000000	0.9999782
X76	1.000000	0.000000
X77	0.000000	-1.999956
X78	0.000000	0.4999891
X79	0.000000	0.000000
X710	0.000000	0.000000
X81	0.000000	0.9999782
X82	0.000000	0.000000
X83	0.000000	0.9999782
X84	0.000000	1.499967
X85	0.000000	0.4999891
X86	0.000000	1.999956
X87	0.000000	0.4999891
X88	0.000000	0.000000
X89	1.000000	0.000000
X810	0.000000	2.499945
X91	0.000000	1.999956
X92	0.000000	1.499967
X93	0.000000	2.499945
X94	0.000000	2.999934
X95	0.000000	0.000000
X96	0.000000	1.499967
X97	0.000000	0.000000
X98	1.000000	0.000000
X99	0.000000	0.000000
X910	0.000000	2.499945
X101	0.000000	-1.999956
X102	0.000000	0.4999891
X103	0.000000	0.000000
X104	0.000000	1.499967
X105	0.000000	0.4999891
X106	0.000000	0.4999891
X107	0.000000	0.000000
X108	0.000000	1.999956
X109	0.000000	2.999934
X1010	1.000000	3.999913
X1	0.000000	0.000000
Row	Slack or Surplus	Dual rice

1	192.0000	-.000000
2	0.000000	0.000000
3	0.000000	9.499792
4	0.000000	3.499924
5	0.000000	2.999934
6	0.000000	4.499902
7	0.000000	-0.9999782
8	0.000000	-3.499924
9	0.000000	8.499814
10	0.000000	7.499836
11	0.000000	1.999956
12	0.000000	-5.999869
13	0.000000	-3.999913
14	0.000000	-4.499902
15	0.000000	-2.999934
16	0.000000	-1.999956
17	0.000000	-1.999956
18	0.000000	-2.499945
19	0.000000	-0.9999782
20	0.000000	0.000000
21	0.000000	0.9999782
22	0.000000	-9.000034
23	0.000000	-6.000192
24	0.000000	-22.99972
25	0.000000	0.000000
26	0.000000	-34.00004
27	0.000000	-52.00004
28	0.000000	-55.99999
29	0.000000	-10.49998
30	0.000000	-35.49991
31	0.000000	-71.99983
32	0.000000	0.4999891
33	0.000000	0.000000
34	0.000000	-1.499967
35	0.000000	-1.499967
36	0.000000	-0.9999782
37	0.000000	3.999913
38	0.000000	3.499924
39	0.000000	2.499945
40	0.000000	1.499967
41	0.000000	0.000000
42	0.000000	0.000000
43	0.000000	-1.499967
44	0.000000	-4.499902
45	0.000000	-2.999934
46	0.000000	-3.999913
47	0.000000	1.999956
48	0.000000	0.000000
49	0.000000	0.4999891
50	0.000000	0.4999891
51	0.000000	0.4999891
52	0.000000	1.999956
53	0.000000	1.499967
54	0.000000	0.4999891
55	0.000000	-0.9999782
56	0.000000	-1.999956

57	0.000000	-0.4999891
58	0.000000	-1.499967
59	0.000000	-1.999956
60	0.000000	-1.499967
61	0.000000	-1.499967
62	0.000000	32.99977
63	0.000000	26.49981
64	0.000000	15.49983
65	0.000000	16.99982

7.5.3 HASIL PASCAL MODEL 4

Urutan Posisi Optimal : 1 2 3 5 4
Nilai Perhitungan : 192

7.5.4 PERHITUNGAN MANUAL MODEL 4

Urutan Peletakan	Nilai Perhitungan	Pembatas	Urutan Peletakan	Nilai Perhitungan	Pembatas
12345	232		34125	186	p3
12354	**192**		34152	170	j14,j24,p3
12435	210	j14,p3	34215	198	j14,p3
12453	178	p3	34251	198	j14,j24,p3
12534	152	j14,p3	34512	150	j14,p3
12543	160	P3	34521	166	p3
13245	216	j24,p3	35124	188	p3
13254	176	j24,p3	35142	180	j14,j24,p3
13425	210	j14,p3	35214	184	j14,p3
13452	178	j24,p3	35241	192	j14,j24,p3
13524	152	j14,p3	35412	178	j14,p3
13542	160	j24,p3	35421	194	p3
14235	214	j24,p3	41235	208	j14,j24,p3
14253	182	j24,p3	41253	176	j14,p3
14325	230	j14	41325	224	J14
14352	198	J14	41352	208	j14
14523	158	j14,p3	41523	152	j24,p3
14532	158	j14,j24,p3	41532	168	j14,j24,p3
15234	184	j14,j24,p3	42135	200	j14,p3
15243	192	j24,p3	42153	168	j14,p3
15324	200	J24	42315	228	j24
15342	208	j24	42351	196	J24
15423	186	j14,p3	42513	156	j24,p3
15432	186	j14,j24,p3	42531	156	j14,p3
21345	220		43125	200	p3
21354	212		43152	184	j14,j24,p3
21435	198	j24,p3	43215	212	j24,p3
21453	166	p3	43251	180	j14,j24,p3
21534	172	j24,p3	43512	164	j24,p3

21543	148	p3	43521	148	p3
23145	196	j24,p3	45123	176	p3
23154	188	j24,p3	45132	192	j14,j24,p3
23415	202	j14,j24,p3	45213	188	p3
23451	186	j24,p3	45231	188	j14,j24,p3
23514	160	j14,j24,p3	45312	212	
23541	152	j24,p3	45321	196	
24135	194	j24,p3	51234	204	j14,j24,p3
24153	162	j24,p3	51243	180	j14,p3
24315	222	J24	51324	220	j24
24351	206	j24	51342	212	J24
24513	150	j14,p3	51423	174	j24,p3
24531	166	j24,p3	51432	190	j14,p3
25134	196	j24,p3	52134	196	j14,p3
25143	172	j24,p3	52143	172	j14,p3
25314	208	j14	52314	208	J14
25341	200	J14	52341	216	j14
25413	178	j14,p3	52413	178	j24,p3
25431	194	j24,p3	52431	210	j14,p3
31245	196	j14,p3	53124	196	p3
31254	188	j14,p3	53142	188	j14,j24,p3
31425	190	j24,p3	53214	192	j24,p3
31452	174	j14,p3	53241	200	j14,j24,p3
31524	164	j24,p3	53412	186	j24,p3
31542	156	j14,p3	53421	202	p3
32145	188	j14,p3	54123	170	p3
32154	180	j14,p3	54132	186	j14,j24,p3
32415	194	j14,j24,p3	54213	182	p3
32451	194	j14,p3	54231	214	j14,j24,p3
32514	152	j14,j24,p3	54312	206	
32541	160	j14,p3	54321	222	

Tabel 7.4 Perhitungan Manual Model 4

7.6 MODEL RESTORAN A

MATRIK U	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CD	1275	1275	1360	2125	2125	1700	1020	1190	1190	1020	1700	1700	1020	1020	340
CE	120	120	128	200	200	160	96	112	112	96	160	160	96	96	32
CF	2025	2025	2160	3375	3375	2700	1620	1890	1890	1620	2700	2700	1620	1620	540
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MATRIK V	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	13125	13125	14000	21875	21875	17500	10500	12250	12250	10500	17500	17500	10500	10500	3500
AE	600	600	640	1000	1000	800	480	560	560	480	800	800	480	480	160
AF	9900	9900	10560	16500	16500	13200	7920	9240	9240	7920	13200	13200	7920	7920	2640
BC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MATRIK S	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	13125	13125	14000	21875	21875	17500	10500	12250	12250	10500	17500	17500	10500	10500	3500
AE	600	600	640	1000	1000	800	480	560	560	480	800	800	480	480	160
AF	9900	9900	10560	16500	16500	13200	7920	9240	9240	7920	13200	13200	7920	7920	2640
BC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MATRIK T	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CD	1275	1275	1360	2125	2125	1700	1020	1190	1190	1020	1700	1700	1020	1020	340
CE	120	120	128	200	200	160	96	112	112	96	160	160	96	96	32
CF	2025	2025	2160	3375	3375	2700	1620	1890	1890	1620	2700	2700	1620	1620	540
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MATRIK M	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	-1	-1	1	1	1	-1	-1	-1	-1	-1	1	1	-1	1	-1
AC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AD	1	1	-1	-1	-1	1	1	1	1	1	-1	-1	1	-1	1
AE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

MATRIK K	12	13	14	15	16	23	24	25	26	34	35	36	45	46	56
AB	1	1	0	0	0	1	1	1	1	1	0	0	1	0	1
AC	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AD	0	0	1	1	1	0	0	0	0	0	1	1	0	1	0
AE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BC	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BD	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CD	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
EF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

MATRIK N				
1	2	3	4	5
1	6	7	8	9
2	6	10	11	12
3	7	10	13	14
4	8	11	13	15
5	9	12	14	15

INDEX	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MATRIK q	1	1	1	1	1	2	2	2	2	3	3	3	4	4	5
MATRIK r	2	3	4	5	6	3	4	5	6	4	5	6	5	6	6

Gambar 7.5 Matrik Bantu Perhitungan Model Restoran A

7.6.1 MODEL LINEAR RESTORAN A

MIN=
(13125*Y11*Y24)+(13125*Y11*Y34)+(14000*Y11*Y44)+(21875*Y11*Y5
4)+(21875*Y11*Y64)+(17500*Y21*Y34)+(10500*Y21*Y44)+(12250*Y21*
Y54)+(12250*Y21*Y64)+(10500*Y31*Y44)+(17500*Y31*Y54)+(17500*Y
31*Y64)+(10500*Y41*Y54)+(10500*Y41*Y64)+(3500*Y51*Y64)+
(600*Y11*Y25)+(600*Y11*Y35)+(640*Y11*Y45)+(1000*Y11*Y55)+(1000
*Y11*Y65)+(800*Y21*Y35)+(480*Y21*Y45)+(560*Y21*Y55)+(560*Y21*
Y65)+(480*Y31*Y45)+(800*Y31*Y55)+(800*Y31*Y65)+(480*Y41*Y55)+
(480*Y41*Y65)+(160*Y51*Y65)+
(9900*Y11*Y26)+(9900*Y11*Y36)+(10560*Y11*Y46)+(16500*Y11*Y56)
+(16500*Y11*Y66)+(13200*Y21*Y36)+(7920*Y21*Y46)+(9240*Y21*Y56
)+(9240*Y21*Y66)+(7920*Y31*Y46)+(13200*Y31*Y56)+(13200*Y31*Y6
6)+(7920*Y41*Y56)+(7920*Y41*Y66)+(2640*Y51*Y66)+
(1275*Y13*Y24)+(1275*Y13*Y34)+(1360*Y13*Y44)+(2125*Y13*Y54)+(2
125*Y13*Y64)+(1700*Y23*Y34)+(1020*Y23*Y44)+(1190*Y23*Y54)+(11
90*Y23*Y64)+(1020*Y33*Y44)+(1700*Y33*Y54)+(1700*Y33*Y64)+(102
0*Y43*Y54)+(1020*Y43*Y64)+(340*Y53*Y64)+
(120*Y13*Y25)+(120*Y13*Y35)+(128*Y13*Y45)+(200*Y13*Y55)+(200*
Y13*Y65)+(160*Y23*Y35)+(96*Y23*Y45)+(112*Y23*Y55)+(112*Y23*Y
65)+(96*Y33*Y45)+(160*Y33*Y55)+(160*Y33*Y65)+(96*Y43*Y55)+(96*
Y43*Y65)+(32*Y53*Y65)+
(2025*Y13*Y26)+(2025*Y13*Y36)+(2160*Y13*Y46)+(3375*Y13*Y56)+(3
375*Y13*Y66)+(2700*Y23*Y36)+(1620*Y23*Y46)+(1890*Y23*Y56)+(18
90*Y23*Y66)+(1620*Y33*Y46)+(2700*Y33*Y56)+(2700*Y33*Y66)+(162
0*Y43*Y56)+(1620*Y43*Y66)+(540*Y53*Y66)+

(13125*Y21*Y14)+(13125*Y31*Y14)+(14000*Y41*Y14)+(21875*Y51*Y1
4)+(21875*Y61*Y14)+(17500*Y31*Y24)+(10500*Y41*Y24)+(12250*Y51*
Y24)+(12250*Y61*Y24)+(10500*Y41*Y34)+(17500*Y51*Y34)+(17500*Y
61*Y34)+(10500*Y51*Y44)+(10500*Y61*Y44)+(3500*Y61*Y54)+
(600*Y21*Y15)+(600*Y31*Y15)+(640*Y41*Y15)+(1000*Y51*Y15)+(1000
*Y61*Y15)+(800*Y31*Y25)+(480*Y41*Y25)+(560*Y51*Y25)+(560*Y61*
Y25)+(480*Y41*Y35)+(800*Y51*Y35)+(800*Y61*Y35)+(480*Y51*Y45)+
(480*Y61*Y45)+(160*Y61*Y55)+
(9900*Y21*Y16)+(9900*Y31*Y16)+(10560*Y41*Y16)+(16500*Y51*Y16)
+(16500*Y61*Y16)+(13200*Y31*Y26)+(7920*Y41*Y26)+(9240*Y51*Y26
)+(9240*Y61*Y26)+(7920*Y41*Y36)+(13200*Y51*Y36)+(13200*Y61*Y3
6)+(7920*Y51*Y46)+(7920*Y61*Y46)+(2640*Y61*Y56)+
(1275*Y23*Y14)+(1275*Y33*Y14)+(1360*Y43*Y14)+(2125*Y53*Y14)+(2
125*Y63*Y14)+(1700*Y33*Y24)+(1020*Y43*Y24)+(1190*Y53*Y24)+(11
90*Y63*Y24)+(1020*Y43*Y34)+(1700*Y53*Y34)+(1700*Y63*Y34)+(102
0*Y53*Y44)+(1020*Y63*Y44)+(340*Y63*Y54)+
(120*Y23*Y15)+(120*Y33*Y15)+(128*Y43*Y15)+(200*Y53*Y15)+(200*
Y63*Y15)+(160*Y33*Y25)+(96*Y43*Y25)+(112*Y53*Y25)+(112*Y63*Y

```
25)+(96*Y43*Y35)+(160*Y53*Y35)+(160*Y63*Y35)+(96*Y53*Y45)+(96*
Y63*Y45)+(32*Y63*Y55)+
(2025*Y23*Y16)+(2025*Y33*Y16)+(2160*Y43*Y16)+(3375*Y53*Y16)+(3
375*Y63*Y16)+(2700*Y33*Y26)+(1620*Y43*Y26)+(1890*Y53*Y26)+(18
90*Y63*Y26)+(1620*Y43*Y36)+(2700*Y53*Y36)+(2700*Y63*Y36)+(162
0*Y53*Y46)+(1620*Y63*Y46)+(540*Y63*Y56);


X11+X12+X13+X14+X15+X16+X17+X18+X19+X110+X1X11+X1X12+X
1X13+X1X14+X1X15=1;
X21 +X22 +X23 +X24 +X25 +X26 +X27 +X28 +X29 +X2X10 +X2X11
+X2X12 +X2X13 +X2X14 +X2X15 =1;
X31 +X32 +X33 +X34 +X35 +X36 +X37 +X38 +X39 +X3X10 +X3X11
+X3X12 +X3X13 +X3X14 +X3X15 =1;
X41 +X42 +X43 +X44 +X45 +X46 +X47 +X48 +X49 +X4X10+X4X11
+X4X12 +X4X13 +X4X14 +X4X15 =1;
X51 +X52 +X53 +X54 +X55 +X56 +X57 +X58 +X59 +X5X10+X5X11
+X5X12 +X5X13 +X5X14 +X5X15 =1;
X61 +X62 +X63 +X64 +X65 +X66 +X67 +X68 +X69 +X6X10+X6X11
+X6X12 +X6X13 +X6X14 +X6X15 =1;
X71 +X72 +X73 +X74 +X75 +X76 +X77 +X78 +X79 +X7X10+X7X11
+X7X12 +X7X13 +X7X14 +X7X15 =1;
X81 +X82 +X83 +X84 +X85 +X86 +X87 +X88 +X89 +X8X10+X8X11
+X8X12 +X8X13 +X8X14 +X8X15 =1;
X91 +X92 +X93 +X94 +X95 +X96 +X97 +X98 +X99 +X9X10+X9X11
+X9X12 +X9X13 +X9X14 +X9X15 =1;
X10X1 +X10X2 +X10X3 +X10X4 +X10X5 +X10X6 +X10X7 +X10X8
+X10X9 +X10X10 +X10X11 +X10X12 +X10X13 +X10X14 +X10X15 =1;
X11X1 +X11X2 +X11X3 +X11X4 +X11X5 +X11X6 +X11X7 +X11X8
+X11X9 +X11X10 +X11X11 +X11X12 +X11X13 +X11X14 +X11X15 =1;
X12X1 +X12X2 +X12X3 +X12X4 +X12X5 +X12X6 +X12X7 +X12X8
+X12X9 +X12X10 +X12X11 +X12X12 +X12X13 +X12X14 +X12X15 =1;
X13X1 +X13X2 +X13X3 +X13X4 +X13X5 +X13X6 +X13X7 +X13X8
+X13X9 +X13X10 +X13X11 +X13X12 +X13X13 +X13X14 +X13X15 =1;
X14X1 +X14X2 +X14X3 +X14X4 +X14X5 +X14X6 +X14X7 +X14X8
+X14X9 +X14X10 +X14X11 +X14X12 +X14X13 +X14X14 +X14X15 =1;
X15X1 +X15X2 +X15X3 +X15X4 +X15X5 +X15X6 +X15X7 +X15X8
+X15X9 +X15X10 +X15X11 +X15X12 +X15X13 +X15X14 +X15X15 =1;
X11+X21+X31+X41+X51+X61+X71+X81+X91+X10X1+X11X1+X12X1+
X13X1+X14X1+X15X1=1;
X12+X22+X32+X42+X52+X62+X72+X82+X92+X10X2+X11X2+X12X2+
X13X2+X14X2+X15X2=1;
X13+X23+X33+X43+X53+X63+X73+X83+X93+X10X3+X11X3+X12X3+
X13X3+X14X3+X15X3=1;
X14+X24+X34+X44+X54+X64+X74+X84+X94+X10X4+X11X4+X12X4+
X13X4+X14X4+X15X4=1;
```

X15+X25+X35+X45+X55+X65+X75+X85+X95+X10X5+X11X5+X12X5+
X13X5+X14X5+X15X5=1;
X16+X26+X36+X46+X56+X66+X76+X86+X96+X10X6+X11X6+X12X6+
X13X6+X14X6+X15X6=1;
X17+X27+X37+X47+X57+X67+X77+X87+X97+X10X7+X11X7+X12X7+
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X13X8+X14X8+X15X8=1;
X19+X29+X39+X49+X59+X69+X79+X89+X99+X10X9+X11X9+X12X9+
X13X9+X14X9+X15X9=1;
X1X10+X2X10+X3X10+X4X10+X5X10+X6X10+X7X10+X8X10+X9X10+
X10X10+X11X10+X12X10+X13X10+X14X10+X15X10=1;
X1X11+X2X11+X3X11+X4X11+X5X11+X6X11+X7X11+X8X11+X9X11+
X10X11+X11X11+X12X11+X13X11+X14X11+X15X11=1;
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X10X12+X11X12+X12X12+X13X12+X14X12+X15X12=1;
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X10X13+X11X13+X12X13+X13X13+X14X13+X15X13=1;
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X10X14+X11X14+X12X14+X13X14+X14X14+X15X14=1;
X1X15+X2X15+X3X15+X4X15+X5X15+X6X15+X7X15+X8X15+X9X15+
X10X15+X11X15+X12X15+X13X15+X14X15+X15X15=1;
Y11+Y12+Y13+Y14+Y15+Y16=1;
Y21+Y22+Y23+Y24+Y25+Y26=1;
Y31+Y32+Y33+Y34+Y35+Y36=1;
Y41+Y42+Y43+Y44+Y45+Y46=1;
Y51+Y52+Y53+Y54+Y55+Y56=1;
Y61+Y62+Y63+Y64+Y65+Y66=1;
Y11+Y21+Y31+Y41+Y51+Y61=1;
Y12+Y22+Y32+Y42+Y52+Y62=1;
Y13+Y23+Y33+Y43+Y53+Y63=1;
Y14+Y24+Y34+Y44+Y54+Y64=1;
Y15+Y25+Y35+Y45+Y55+Y65=1;
Y16+Y26+Y36+Y46+Y56+Y66=1;
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X56+X5X10+X5X11+X5X12-4*Y31=1;
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4X2+X14X3+X14X4+X14X5-4*Y14=1;
X31+X36+X37+X38+X39+X71+X76+X77+X78+X79+X10X1+X10X6+X1
0X7+X10X8+X10X9+X13X1+X13X6+X13X7+X13X8+X13X9+X14X1+X1
4X6+X14X7+X14X8+X14X9-4*Y24=1;

X32+X36+X3X10+X3X11+X3X12+X72+X76+X7X10+X7X11+X7X12+X1
0X2+X10X6+X10X10+X10X11+X10X12+X13X2+X13X6+X13X10+X13X
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X41+X42+X43+X44+X45+X81+X82+X83+X84+X85+X11X1+X11X2+X1
1X3+X11X4+X11X5+X13X1+X13X2+X13X3+X13X4+X13X5+X15X1+X1
5X2+X15X3+X15X4+X15X5-4*Y15=1;
X41+X46+X47+X48+X49+X81+X86+X87+X88+X89+X11X1+X11X6+X1
1X7+X11X8+X11X9+X13X1+X13X6+X13X7+X13X8+X13X9+X15X1+X1
5X6+X15X7+X15X8+X15X9-4*Y25=1;
X42+X46+X4X10+X4X11+X4X12+X82+X86+X8X10+X8X11+X8X12+X1
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1X4+X11X8+X11X11+X11X13+X11X15+X13X4+X13X8+X13X11+X13X
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X51+X52+X53+X54+X55+X91+X92+X93+X94+X95+X12X1+X12X2+X1
2X3+X12X4+X12X5+X14X1+X14X2+X14X3+X14X4+X14X5+X15X1+X1
5X2+X15X3+X15X4+X15X5-4*Y16=1;
X51+X56+X57+X58+X59+X91+X96+X97+X98+X99+X12X1+X12X6+X1
2X7+X12X8+X12X9+X14X1+X14X6+X14X7+X14X8+X14X9+X15X1+X1
5X6+X15X7+X15X8+X15X9-4*Y26=1;
X52+X56+X5X10+X5X11+X5X12+X92+X96+X9X10+X9X11+X9X12+X1
2X2+X12X6+X12X10+X12X11+X12X12+X14X2+X14X6+X14X10+X14X
11+X14X12+X15X2+X15X6+X15X10+X15X11+X15X12-4*Y36=1;
X53+X57+X5X10+X5X13+X5X14+X93+X97+X9X10+X9X13+X9X14+X1
2X3+X12X7+X12X10+X12X13+X12X14+X14X3+X14X7+X14X10+X14X
13+X14X14+X15X3+X15X7+X15X10+X15X13+X15X14-4*Y46=1;
X54+X58+X5X11+X5X13+X5X15+X94+X98+X9X11+X9X13+X9X15+X1
2X4+X12X8+X12X11+X12X13+X12X15+X14X4+X14X8+X14X11+X14X
13+X14X15+X15X4+X15X8+X15X11+X15X13+X15X15-4*Y56=1;

```
X55+X59+X5X12+X5X14+X5X15+X95+X99+X9X12+X9X14+X9X15+X1
2X5+X12X9+X12X12+X12X14+X12X15+X14X5+X14X9+X14X12+X14X
14+X14X15+X15X5+X15X9+X15X12+X15X14+X15X15-4*Y66=1;
Y21=0;                  @BIN (X26);             @BIN (X54);
Y31=0;                  @BIN (X27);             @BIN (X55);
Y41=0;                  @BIN (X28);             @BIN (X56);
Y51=0;                  @BIN (X29);             @BIN (X57);
Y61=0;                  @BIN (X2X10);           @BIN (X58);
Y23=0;                  @BIN (X2X11);           @BIN (X59);
Y43=0;                  @BIN (X2X12);           @BIN (X5X10);
Y53=0;                  @BIN (X2X13);           @BIN (X5X11);
X31=0;                  @BIN (X2X14);           @BIN (X5X12);
X32=0;                  @BIN (X2X15);           @BIN (X5X13);
X13=0;                  @BIN (X31);             @BIN (X5X14);
X14=0;                  @BIN (X32);             @BIN (X5X15);
X15=0;                  @BIN (X33);             @BIN (X61);
X36=0;                  @BIN (X34);             @BIN (X62);
X37=0;                  @BIN (X35);             @BIN (X63);
X38=0;                  @BIN (X36);             @BIN (X64);
X39=0;                  @BIN (X37);             @BIN (X65);
X3X10=0;                @BIN (X38);             @BIN (X66);
X1X11=0;                @BIN (X39);             @BIN (X67);
X1X12=0;                @BIN (X3X10);           @BIN (X68);
X3X13=0;                @BIN (X3X11);           @BIN (X69);
X1X14=0;                @BIN (X3X12);           @BIN (X6X10);
X3X15=0;                @BIN (X3X13);           @BIN (X6X11);
@BIN (X11);             @BIN (X3X14);           @BIN (X6X12);
@BIN (X12);             @BIN (X3X15);           @BIN (X6X13);
@BIN (X13);             @BIN (X41);             @BIN (X6X14);
@BIN (X14);             @BIN (X42);             @BIN (X6X15);
@BIN (X15);             @BIN (X43);             @BIN (X71);
@BIN (X16);             @BIN (X44);             @BIN (X72);
@BIN (X17);             @BIN (X45);             @BIN (X73);
@BIN (X18);             @BIN (X46);             @BIN (X74);
@BIN (X19);             @BIN (X47);             @BIN (X75);
@BIN (X1X10);           @BIN (X48);             @BIN (X76);
@BIN (X1X11);           @BIN (X49);             @BIN (X77);
@BIN (X1X12);           @BIN (X4X10);           @BIN (X78);
@BIN (X1X13);           @BIN (X4X11);           @BIN (X79);
@BIN (X1X14);           @BIN (X4X12);           @BIN (X7X10);
@BIN (X1X15);           @BIN (X4X13);           @BIN (X7X11);
@BIN (X21);             @BIN (X4X14);           @BIN (X7X12);
@BIN (X22);             @BIN (X4X15);           @BIN (X7X13);
@BIN (X23);             @BIN (X51);             @BIN (X7X14);
@BIN (X24);             @BIN (X52);             @BIN (X7X15);
@BIN (X25);             @BIN (X53);             @BIN (X81);
```

@BIN (X82);
@BIN (X83);
@BIN (X84);
@BIN (X85);
@BIN (X86);
@BIN (X87);
@BIN (X88);
@BIN (X89);
@BIN (X8X10);
@BIN (X8X11);
@BIN (X8X12);
@BIN (X8X13);
@BIN (X8X14);
@BIN (X8X15);
@BIN (X91);
@BIN (X92);
@BIN (X93);
@BIN (X94);
@BIN (X95);
@BIN (X96);
@BIN (X97);
@BIN (X98);
@BIN (X99);
@BIN (X9X10);
@BIN (X9X11);
@BIN (X9X12);
@BIN (X9X13);
@BIN (X9X14);
@BIN (X9X15);
@BIN (X10X1);
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@BIN (X10X3);
@BIN (X10X4);
@BIN (X10X5);
@BIN (X10X6);
@BIN (X10X7);
@BIN (X10X8);
@BIN (X10X9);
@BIN (X10X10);
@BIN (X10X11);
@BIN (X10X12);
@BIN (X10X13);
@BIN (X10X14);
@BIN (X10X15);
@BIN (X11X1);
@BIN (X11X2);
@BIN (X11X3);
@BIN (X11X4);
@BIN (X11X5);
@BIN (X11X6);
@BIN (X11X7);
@BIN (X11X8);
@BIN (X11X9);
@BIN (X11X10);
@BIN (X11X11);
@BIN (X11X12);
@BIN (X11X13);
@BIN (X11X14);
@BIN (X11X15);
@BIN (X12X1);
@BIN (X12X2);
@BIN (X12X3);
@BIN (X12X4);
@BIN (X12X5);
@BIN (X12X6);
@BIN (X12X7);
@BIN (X12X8);
@BIN (X12X9);
@BIN (X12X10);
@BIN (X12X11);
@BIN (X12X12);
@BIN (X12X13);
@BIN (X12X14);
@BIN (X12X15);
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@BIN (X13X2);
@BIN (X13X3);
@BIN (X13X4);
@BIN (X13X5);
@BIN (X13X6);
@BIN (X13X7);
@BIN (X13X8);
@BIN (X13X9);
@BIN (X13X10);
@BIN (X13X11);
@BIN (X13X12);
@BIN (X13X13);
@BIN (X13X14);
@BIN (X13X15);
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@BIN (X14X2);
@BIN (X14X3);
@BIN (X14X4);
@BIN (X14X5);
@BIN (X14X6);
@BIN (X14X7);
@BIN (X14X8);
@BIN (X14X9);
@BIN (X14X10);
@BIN (X14X11);
@BIN (X14X12);
@BIN (X14X13);
@BIN (X14X14);
@BIN (X14X15);
@BIN (X15X1);
@BIN (X15X2);
@BIN (X15X3);
@BIN (X15X4);
@BIN (X15X5);
@BIN (X15X6);
@BIN (X15X7);
@BIN (X15X8);
@BIN (X15X9);
@BIN (X15X10);
@BIN (X15X11);
@BIN (X15X12);
@BIN (X15X13);
@BIN (X15X14);
@BIN (X15X15);
@BIN (Y11);
@BIN (Y12);
@BIN (Y13);
@BIN (Y14);
@BIN (Y15);
@BIN (Y16);
@BIN (Y21);
@BIN (Y22);
@BIN (Y23);
@BIN (Y24);
@BIN (Y25);
@BIN (Y26);
@BIN (Y31);
@BIN (Y32);
@BIN (Y33);
@BIN (Y34);
@BIN (Y35);
@BIN (Y36);
@BIN (Y41);

```
@BIN (Y42);   @BIN (Y52);   @BIN (Y62);
@BIN (Y43);   @BIN (Y53);   @BIN (Y63);
@BIN (Y44);   @BIN (Y54);   @BIN (Y64);
@BIN (Y45);   @BIN (Y55);   @BIN (Y65);
@BIN (Y46);   @BIN (Y56);   @BIN (Y66);
@BIN (Y51);   @BIN (Y61);   END
```

7.6.2 HASIL LINGO RESTORAN A

```
Local optimal solution found at iteration:          94
  Objective value:                              27842.00
```

Variable	Value	Reduced Cost
Y11	1.000000	0.000000
Y24	0.000000	0.000000
Y34	0.000000	48.00001
Y44	1.000000	0.000000
Y54	0.000000	6851.000
Y64	0.000000	6807.000
Y21	0.000000	0.000000
Y31	0.000000	0.000000
Y41	0.000000	0.000000
Y51	0.000000	0.000000
Y25	0.000000	0.000000
Y35	0.000000	0.000000
Y45	0.000000	0.000000
Y55	1.000000	0.000000
Y65	0.000000	240.0000
Y26	1.000000	0.000000
Y36	0.000000	348.0000
Y46	0.000000	0.000000
Y56	0.000000	4516.000
Y66	0.000000	4272.000
Y13	0.000000	12857.00
Y23	0.000000	0.000000
Y33	0.000000	913.9997
Y43	0.000000	0.000000
Y53	0.000000	0.000000
Y14	0.000000	0.000000
Y61	0.000000	0.000000
Y15	0.000000	0.000000
Y16	0.000000	3775.000
Y63	1.000000	0.000000
X11	0.000000	12.00000
X12	1.000000	0.000000
X13	0.000000	0.000000
X14	0.000000	0.000000
X15	0.000000	0.000000
X16	0.000000	68.00001
X17	0.000000	74.00000
X18	0.000000	0.000000
X19	0.000000	74.00000
X110	0.000000	0.000000
X1X11	0.000000	0.000000

X1X12	0.000000	0.000000
X1X13	0.000000	176.2500
X1X14	0.000000	0.000000
X1X15	0.000000	182.2500
X21	0.000000	0.000000
X22	0.000000	0.000000
X23	0.000000	12.00000
X24	0.000000	0.000000
X25	1.000000	0.000000
X26	0.000000	3115.500
X27	0.000000	3115.500
X28	0.000000	3115.500
X29	0.000000	3115.500
X2X10	0.000000	3219.000
X2X11	0.000000	3231.000
X2X12	0.000000	3219.000
X2X13	0.000000	3297.750
X2X14	0.000000	3291.750
X2X15	0.000000	3303.750
X31	0.000000	0.000000
X32	0.000000	0.000000
X33	1.000000	0.000000
X34	0.000000	0.000000
X35	0.000000	0.000000
X36	0.000000	0.000000
X37	0.000000	0.000000
X38	0.000000	0.000000
X39	0.000000	0.000000
X3X10	0.000000	0.000000
X3X11	0.000000	3334.500
X3X12	0.000000	3322.500
X3X13	0.000000	0.000000
X3X14	0.000000	3462.000
X3X15	0.000000	0.000000
X41	0.000000	0.000000
X42	0.000000	0.000000
X43	0.000000	12.00000
X44	1.000000	0.000000
X45	0.000000	5.999991
X46	0.000000	196.0000
X47	0.000000	196.0000
X48	0.000000	196.0000
X49	0.000000	202.0000
X4X10	0.000000	299.5000
X4X11	0.000000	311.5000
X4X12	0.000000	305.5000
X4X13	0.000000	378.2500
X4X14	0.000000	378.2500
X4X15	0.000000	390.2500
X51	1.000000	-103.5000
X52	0.000000	0.000000
X53	0.000000	0.000000
X54	0.000000	0.000000
X55	0.000000	0.000000
X56	0.000000	3115.500
X57	0.000000	3103.500

X58	0.000000	3115.500
X59	0.000000	3115.500
X5X10	0.000000	3310.500
X5X11	0.000000	3334.500
X5X12	0.000000	3322.500
X5X13	0.000000	3389.250
X5X14	0.000000	3383.250
X5X15	0.000000	3407.250
X61	0.000000	3516.750
X62	0.000000	3297.750
X63	0.000000	3249.000
X64	0.000000	3151.000
X65	0.000000	3225.000
X66	0.000000	250.2500
X67	0.000000	189.5000
X68	0.000000	103.5000
X69	0.000000	177.5000
X6X10	0.000000	74.00000
X6X11	0.000000	0.000000
X6X12	1.000000	62.00000
X6X13	0.000000	5.999991
X6X14	0.000000	74.00000
X6X15	0.000000	0.000000
X71	0.000000	3231.000
X72	0.000000	3115.500
X73	0.000000	3133.500
X74	0.000000	3047.500
X75	0.000000	3121.500
X76	0.000000	68.00001
X77	0.000000	74.00000
X78	0.000000	0.000000
X79	0.000000	74.00000
X7X10	1.000000	62.00000
X7X11	0.000000	0.000000
X7X12	0.000000	62.00000
X7X13	0.000000	72.74997
X7X14	0.000000	140.7500
X7X15	0.000000	78.74998
X81	0.000000	6430.250
X82	0.000000	6211.250
X83	0.000000	6162.500
X84	0.000000	6064.500
X85	0.000000	6144.500
X86	0.000000	244.2500
X87	0.000000	183.5000
X88	0.000000	97.49999
X89	0.000000	177.5000
X8X10	0.000000	68.00001
X8X11	1.000000	-5.999991
X8X12	0.000000	62.00000
X8X13	0.000000	0.000000
X8X14	0.000000	74.00000
X8X15	0.000000	0.000000
X91	0.000000	3309.750
X92	0.000000	3194.250
X93	0.000000	3133.500

X94	0.000000	3047.500
X95	0.000000	3121.500
X96	1.000000	146.7500
X97	0.000000	74.00000
X98	0.000000	0.000000
X99	0.000000	74.00000
X9X10	0.000000	62.00000
X9X11	0.000000	0.000000
X9X12	0.000000	62.00000
X9X13	0.000000	-6.000009
X9X14	0.000000	62.00000
X9X15	0.000000	0.000000
X10X1	0.000000	103.5000
X10X2	0.000000	0.000000
X10X3	0.000000	12.00000
X10X4	0.000000	0.000000
X10X5	0.000000	0.000000
X10X6	0.000000	0.000000
X10X7	0.000000	0.000000
X10X8	0.000000	0.000000
X10X9	0.000000	0.000000
X10X10	0.000000	0.000000
X10X11	0.000000	12.00000
X10X12	0.000000	0.000000
X10X13	0.000000	78.74998
X10X14	1.000000	72.74999
X10X15	0.000000	84.74999
X11X1	0.000000	3296.750
X11X2	0.000000	3089.750
X11X3	0.000000	3035.000
X11X4	0.000000	3011.000
X11X5	0.000000	3017.000
X11X6	0.000000	170.2500
X11X7	0.000000	103.5000
X11X8	0.000000	91.49998
X11X9	0.000000	97.49998
X11X10	0.000000	0.000000
X11X11	0.000000	0.000000
X11X12	0.000000	-6.000009
X11X13	0.000000	0.000000
X11X14	0.000000	0.000000
X11X15	1.000000	0.000000
X12X1	0.000000	182.2500
X12X2	0.000000	78.74998
X12X3	0.000000	12.00000
X12X4	0.000000	0.000000
X12X5	0.000000	0.000000
X12X6	0.000000	78.74998
X12X7	0.000000	0.000000
X12X8	0.000000	0.000000
X12X9	1.000000	0.000000
X12X10	0.000000	0.000000
X12X11	0.000000	12.00000
X12X12	0.000000	0.000000
X12X13	0.000000	0.000000
X12X14	0.000000	-5.999991

X12X15	0.000000	6.000009
X13X1	0.000000	3023.000
X13X2	0.000000	2919.500
X13X3	0.000000	2931.500
X13X4	0.000000	2919.500
X13X5	0.000000	2925.500
X13X6	0.000000	0.000000
X13X7	0.000000	0.000000
X13X8	0.000000	0.000000
X13X9	0.000000	5.999991
X13X10	0.000000	0.000000
X13X11	0.000000	12.00000
X13X12	0.000000	5.999991
X13X13	1.000000	78.74998
X13X14	0.000000	78.74998
X13X15	0.000000	90.74998
X14X1	0.000000	0.000000
X14X2	0.000000	0.000000
X14X3	0.000000	0.000000
X14X4	0.000000	0.000000
X14X5	0.000000	0.000000
X14X6	0.000000	0.000000
X14X7	1.000000	-12.00000
X14X8	0.000000	0.000000
X14X9	0.000000	0.000000
X14X10	0.000000	91.49998
X14X11	0.000000	115.5000
X14X12	0.000000	103.5000
X14X13	0.000000	170.2500
X14X14	0.000000	164.2500
X14X15	0.000000	188.2500
X15X1	0.000000	3101.750
X15X2	0.000000	2998.250
X15X3	0.000000	2931.500
X15X4	0.000000	2919.500
X15X5	0.000000	2925.500
X15X6	0.000000	78.74998
X15X7	0.000000	0.000000
X15X8	1.000000	0.000000
X15X9	0.000000	5.999991
X15X10	0.000000	0.000000
X15X11	0.000000	12.00000
X15X12	0.000000	5.999991
X15X13	0.000000	0.000000
X15X14	0.000000	0.000000
X15X15	0.000000	12.00000
X1X10	0.000000	165.5000
Y12	0.000000	0.000000
Y22	0.000000	0.000000
Y32	1.000000	0.000000
Y42	0.000000	0.000000
Y52	0.000000	0.000000
Y62	0.000000	0.000000

Row	Slack or Surplus	Dual Price
1	27842.00	-1.000000

2	0.000000	0.000000
3	0.000000	-2686.750
4	0.000000	-4199.500
5	0.000000	232.7500
6	0.000000	-2858.250
7	0.000000	7590.000
8	0.000000	5973.750
9	0.000000	13423.00
10	0.000000	7315.000
11	0.000000	171.5000
12	0.000000	7614.750
13	0.000000	1512.750
14	0.000000	6010.500
15	0.000000	0.000000
16	0.000000	7351.750
17	0.000000	-7407.750
18	0.000000	6009.250
19	0.000000	-7499.250
20	0.000000	5930.500
21	0.000000	-7511.250
22	0.000000	0.000000
23	0.000000	-13520.50
24	0.000000	-78.74998
25	0.000000	-13520.50
26	0.000000	0.000000
27	0.000000	13453.75
28	0.000000	-0.181898E-04
29	0.000000	0.000000
30	0.000000	-13447.75
31	0.000000	5.999991
32	0.000000	536.0000
33	0.000000	364.5000
34	0.000000	-26931.50
35	0.000000	0.000000
36	0.000000	-27203.50
37	0.000000	-23.99996
38	0.000000	-23496.50
39	0.000000	209.5000
40	0.000000	8736.000
41	0.000000	0.000000
42	0.000000	-736.0000
43	0.000000	0.000000
44	0.000000	484.8750
45	0.000000	6605.000
46	0.000000	0.000000
47	0.000000	6793.625
48	0.000000	78.74998
49	0.000000	6799.625
50	0.000000	186.3750
51	0.000000	143.5000
52	0.000000	-6680.500
53	0.000000	52.37500
54	0.000000	-6748.500
55	0.000000	46.37500
56	0.000000	0.000000
57	0.000000	3004.625

58	0.000000	-3807.375
59	0.000000	2919.500
60	0.000000	-3807.375
61	0.000000	2913.500
62	0.000000	665.2500
63	0.000000	3669.875
64	0.000000	-3038.625
65	0.000000	3755.000
66	0.000000	-2959.875
67	0.000000	3761.000
68	0.000000	0.000000
69	0.000000	85.12498
70	0.000000	-6726.875
71	0.000000	0.000000
72	0.000000	-6726.875
73	0.000000	0.000000
74	0.000000	33.99999
75	0.000000	3038.625
76	0.000000	-3669.875
77	0.000000	3045.000
78	0.000000	-3669.875
79	0.000000	3051.000
80	0.000000	38492.00
81	0.000000	25928.00
82	0.000000	42271.00
83	0.000000	31275.00
84	0.000000	30819.00
85	0.000000	1786.000
86	0.000000	1226.000
87	0.000000	328.0000
88	0.000000	182.2500
89	0.000000	78.74998
90	0.000000	-17.99999
91	0.000000	68.00001
92	0.000000	-5.999091
93	0.000000	-3036.750
94	0.000000	-3103.500
95	0.000000	-3115.500
96	0.000000	-3115.500
97	0.000000	-3310.500
98	0.000000	-103.5000
99	0.000000	-165.5000
100	0.000000	-3468.000
101	0.000000	-244.2500
102	0.000000	-3486.000

7.6.3 HASIL PASCAL RESTORAN A

Urutan Posisi Optimal : 1 6 2 4 5 3
Nilai Perhitungan : 27842

7.6.4 PERHITUNGAN MANUAL RESTORAN A

Urutan Peletakan	Nilai Perhitungan	Pembatas	Urutan Peletakan	Nilai Perhitungan	Pembatas
123456	35360		132456	34522	P3
123465	35380		132465	34522	P3
123546	43511		132546	42191	P3
123564	43511		132564	36357	P3
123645	36915		132645	42191	P3
123654	36915		132654	36357	P3
124356	33361	P3	142356	34327	P3
124365	33361	P3	142365	34327	P3
124536	41711	P3	142536	42215	P3
124563	32601		142563	32091	J14
124635	41711	P3	142635	42215	P3
124653	28037		142653	27527	J14
125364	28037	P3	152346	33951	P3
125346	32601	P3	152364	28117	P3
125436	32820	P3	152436	34170	P3
125463	32820		152463	28732	P3
125634	35155	P3	152634	36005	P3
125643	35155		152643	35107	
126345	32601	P3	162345	33951	P3
126354	28037	P3	162354	2117	P3
126435	32820	P3	162435	34170	P3
126453	28652		***162453***	***27842***	
126534	35155	P3	162534	36005	P3
126543	35551		162543	34741	

Tabel 7.5 Perhitungan manual Restoran A

LAMPIRAN 2

Pembuatan Model Dasar

Pada pengembangan model dilakukan beberapa perubahan pada model PBLP yang lama, sehingga dapat mempertimbangkan beberapa faktor tambahan.

Pembuatan Model :

Secara garis besar, proses perhitungan meliputi :

8.1 Input

Proses input merupakan proses pengumpulan data yang akan digunakan untuk perhitungan model penempatan optimal dengan nilai perpindahan yang terminimasi.

Data yang diperlukan :

a. Matrik Jarak

Merupakan matrik jarak perpindahan antar lokasi.

b. Matrik Frekuensi

Merupakan matrik frekuensi perpindahan yang terjadi antar fasilitas.

c. Matrik Kedekatan

Merupakan matrik yang menyatakan suatu lokasi berdekatan atau berjauhan dengan suatu lokasi lain. Kriteria penilaian suatu lokasi dinyatakan berjauhan atau berdekatan dengan lokasi lain didasarkan pada keputusan pihak pengguna.

d. Matrik Karakter

Merupakan matrik yang menyatakan suatu fasilitas harus dialokasikan berdekatan atau berjauhan dengan suatu fasilitas lain, atau bebas dialokasikan berdekatan dengan fasilitas lain. Sebagai contoh fasilitas penyimpanan bahan bakar tidak dapat diletakan berdekatan dengan fasilitas pembakaran, karena panas dari fasilitas pembakaran dapat mengakibatkan bahan bakar pada fasilitas penyimpanan bahan bakar terbakar.

e. Matrik Peletakan

Merupakan matrik yang meyatakan suatu fasilitas dapat dialokasikan pada suatu lokasi tertentu.

f. Matrik Konversi biaya

Merupakan matrik yang berisi nilai konversi, yang menyatakan nilai perpindahan yang terjadi antar fasilitas. Nilai konversi adalah suatu bentuk nilai yang mewakili nilai perpindahan yang terjadi antar fasilitas, missal : nilai berat perpindahan, nilai rupiah perpindahan, atau gabungan antara nilai berat dan nilai rupiah perpindahan.

8.2 Perhitungan :

Pada proses perhitungan dilakukan perhitungan penempatan optimal untuk setiap fasilitas berdasarkan nilai perpindahan terminimasi dan pertimbangan faktor pembatas.

Proses perhitungan melalui beberapa tahap :

a. Perhitungan Matrik Jarak dikalikan dengan Matrik Frekuensi dan Matrik Konversi.

Merupakan matrik nilai perpindahan total yang terjadi antar fasilitas.

b. Pembuatan Matrik Pengabungan Matrik Karakter dan Matrik Kedekatan.

Merupakan matrik yang berfungsi dalam mempermudah pembuatan model fungsi pembatas untuk karakter fasilitas.

c. Pembuatan Matrik Gabungan

Merupakan matrik yang mencantumkan setiap pasangan fasilitas yang mungkin terjadi dialokasikan pada setiap pasangan lokasi yang mungkin terjadi.

d. Pembuatan Matrik Penempatan Optimal (Y)

Merupakan matrik yang mencantumkan pengalokasian setiaap fasilitas.

e. Perhitungan Matrik Pembantu

Merupakan matrik yang berfungsi untuk mempermudah dalam perancangan model matematis yang menghubungkan antara Matrik Pengalokasian dengan Matrik Penempatan Optimal.

f. Pembuatan Model Matematis

Pembuatan model berguna untuk penentuan pengalokasian fasilitas yang *optimal berdasrkan perhitungan nilai total perpindahan yang minimal* dan pertimbangan fungsi – fungsi pembatas.

8.3 Output :

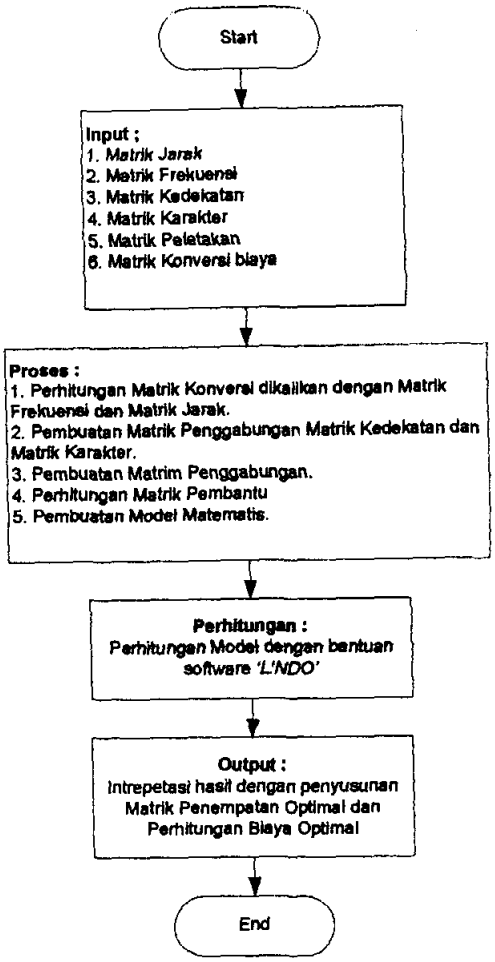
Merupakan hasil akhir dari proses perhitungan yang mencantumkan :

a. Penempatan yang optimal (layout optimal)

Menyatakan pengalokasian fasilitas yang optimal.

b. Nilai perpindahan dari penempatan yang Optimal

Menyatakan nilai total perpindahan dari pengalokasian fasilitas yang optimal.



Gambar 8.1 Flowchart Perhitungan

Penjelasan Pembuatan Model :

Keterangan untuk matrik:

1,2,3,4,... = LOKASI 1,2,3,4,...

A,B,C,D,... = FASILITAS A,B,C,D,...

8.1 Input :

a. Matrik Jarak (Δ)

JARAK	1	2	3	4
1	Δ_{11}	Δ_{12}	Δ_{13}	Δ_{14}
2	Δ_{21}	Δ_{22}	Δ_{23}	Δ_{24}
3	Δ_{31}	Δ_{32}	Δ_{33}	Δ_{34}
4	Δ_{41}	Δ_{42}	Δ_{43}	Δ_{44}

Gambar 8.2 Matrik Jarak

b. Matrik Frekuensi (f)

FREKUENSI	A	B	C	D
A	f_{11}	f_{12}	f_{13}	f_{14}
B	f_{21}	f_{22}	f_{23}	f_{24}
C	f_{31}	f_{32}	f_{33}	f_{34}
D	f_{41}	f_{42}	f_{43}	f_{44}

Gambar 8.3 Matrik Frekuensi

c. Matrik Karakter (α)

KARAKTER	A	B	C	D
A	α_{11}	α_{12}	α_{13}	α_{14}
B	α_{21}	α_{22}	α_{23}	α_{24}
C	α_{31}	α_{32}	α_{33}	α_{34}
D	α_{41}	α_{42}	α_{43}	α_{44}

Gambar 8.4 Matrik Karakter

Keterangan :

Nilai = 1 , jika 2 fasilitas dinyatakan tidak boleh didekatkan

Nilai = 0 , jika 2 fasilitas dinyatakan bebas diletakan berdekatan atau tidak berdekatan

Nilai = -1 , jika 2 fasilitas dinyatakan harus berdekatan

d. Matrik Kedekatan (β)

KEDEKATAN	1	2	3	4
1	β_{11}	β_{12}	β_{13}	β_{14}
2	β_{21}	β_{22}	β_{23}	β_{24}
3	β_{31}	β_{32}	β_{33}	β_{34}
4	β_{41}	β_{42}	β_{43}	β_{44}

Gambar 8.5 Matrik Kedekatan

Keterangan :

Nilai = -1 , jika 2 lokasi dinyatakan tidak berdekatan

Nilai = 1 , jika 2 lokasi dinyatakan berdekatan

e. Matrik Peletakan (ρ)

PELETAKAN	A	B	C	D
1	ρ_{11}	ρ_{12}	ρ_{13}	ρ_{14}
2	ρ_{21}	ρ_{22}	ρ_{23}	ρ_{24}
3	ρ_{31}	ρ_{32}	ρ_{33}	ρ_{34}
4	ρ_{41}	ρ_{42}	ρ_{43}	ρ_{44}

Gambar 8.6 Matrik Peletakan

Keterangan :

Nilai = 0 , jika fasilitas tidak dapat dilokasikan.

Nilai = 1 , jika fasilitas dapat dialokasikan.

f. Matrik Konversi biaya (¢)

KONVERSI	A	B	C	D
A	$¢_{11}$	$¢_{12}$	$¢_{13}$	$¢_{14}$
B	$¢_{21}$	$¢_{22}$	$¢_{23}$	$¢_{24}$
C	$¢_{31}$	$¢_{32}$	$¢_{33}$	$¢_{34}$
D	$¢_{41}$	$¢_{42}$	$¢_{43}$	$¢_{44}$

Gambar 8.7 Matrik Konversi Biaya

8.2 Perhitungan :

a. Perhitungan Matrik Frekuensi dikalikan dengan Matrik Jarak dan Matrik Konversi

Merupakan matrik pembantu untuk perhitungan nilai total perpindahan.

Dibagi menjadi 2 matrik, yaitu :

a1. Perhitungan Matrik Frekuensi dikalikan dengan Matrik Jarak dan matrik Konversi 1 (ψ)

Martrik ψ merupakan matrik yang menghitung nilai setiap perpindahan yang terjadi untuk jalur forward.

Ψ_{11}	Ψ_{12}	Ψ_{13}	Ψ_{14}	Ψ_{15}	Ψ_{16}
Ψ_{21}	Ψ_{22}	Ψ_{23}	Ψ_{24}	Ψ_{25}	Ψ_{26}
Ψ_{31}	Ψ_{32}	Ψ_{33}	Ψ_{34}	Ψ_{35}	Ψ_{36}
Ψ_{41}	Ψ_{42}	Ψ_{43}	Ψ_{44}	Ψ_{45}	Ψ_{46}
Ψ_{51}	Ψ_{52}	Ψ_{53}	Ψ_{54}	Ψ_{55}	Ψ_{56}
Ψ_{61}	Ψ_{62}	Ψ_{63}	Ψ_{64}	Ψ_{65}	Ψ_{66}

Gambar 8.8 Matrik Ψ

Perhitungan :

$$\psi_{ij} = f\,\theta_i\mu_i * \Delta\,\theta_j\mu_j * ¢\,\theta_i\mu_i$$

a2. Perhitungan Matrik Frekuensi dikalikan dengan Matrik Jarak dan Matrik Konversi 2 (ϑ)

Martrik ϑ merupakan matrik yang menghitung nilai setiap perpindahan yang terjadi untuk jalur backward.

ϑ_{11}	ϑ_{12}	ϑ_{13}	ϑ_{14}	ϑ_{15}	ϑ_{16}
ϑ_{21}	ϑ_{22}	ϑ_{23}	ϑ_{24}	ϑ_{25}	ϑ_{26}
ϑ_{31}	ϑ_{32}	ϑ_{33}	ϑ_{34}	ϑ_{35}	ϑ_{36}
ϑ_{41}	ϑ_{42}	ϑ_{43}	ϑ_{44}	ϑ_{45}	ϑ_{46}
ϑ_{51}	ϑ_{52}	ϑ_{53}	ϑ_{54}	ϑ_{55}	ϑ_{56}
ϑ_{61}	ϑ_{62}	ϑ_{63}	ϑ_{64}	ϑ_{65}	ϑ_{66}

Gambar 8.9 Matrik ϑ

Perhitungan :

$$\vartheta_{ij} = f\ \mu_i \theta_i * \Delta\ \mu_j \theta_j * \not{C}\ \mu_i \theta_i$$

a3. Perhitungan Matrik Frekuensi dikalikan dengan Matrik Jarak dan matrik Konversi 3 (σ)

Martrik σ merupakan matrik yang menghitung nilai setiap perpindahan yang terjadi untuk jalur forward.

σ_{11}	σ_{12}	σ_{13}	σ_{14}	σ_{15}	σ_{18}
σ_{21}	σ_{22}	σ_{23}	σ_{24}	σ_{25}	σ_{28}
σ_{31}	σ_{32}	σ_{33}	σ_{34}	σ_{35}	σ_{36}
σ_{41}	σ_{42}	σ_{43}	σ_{44}	σ_{45}	σ_{48}
σ_{51}	σ_{52}	σ_{53}	σ_{54}	σ_{55}	σ_{56}
σ_{61}	σ_{62}	σ_{63}	σ_{64}	σ_{65}	σ_{66}

Gambar 8.10 Matrik σ

Perhitungan :

$$\sigma_{ij} = f\ \mu_i \theta_i * \Delta\ \theta_j \mu_j * \not{C}\ \mu_i \theta_i$$

a4. Perhitungan Matrik Frekuensi dikalikan dengan Matrik Jarak dan Matrik Konversi 4 (τ)

Martrik τ merupakan matrik yang menghitung nilai setiap perpindahan yang terjadi untuk jalur backward.

τ_{11}	τ_{12}	τ_{13}	τ_{14}	τ_{15}	τ_{16}
τ_{21}	τ_{22}	τ_{23}	τ_{24}	τ_{25}	τ_{26}
τ_{31}	τ_{32}	τ_{33}	τ_{34}	τ_{35}	τ_{36}
τ_{41}	τ_{42}	τ_{43}	τ_{44}	τ_{45}	τ_{46}
τ_{51}	τ_{52}	τ_{53}	τ_{54}	τ_{55}	τ_{56}
τ_{61}	τ_{62}	τ_{63}	τ_{64}	τ_{65}	τ_{66}

Gambar 8.11 Matrik τ

Perhitungan :

$$\tau_{ij} = f\ \theta_i\mu_i * \Delta\ \mu_j\ \theta_j * \not\subset\ \theta_i\mu_i$$

b. Perhitungan Penggabungan Matrik karakter dan Matrik Kedekatan

Merupakan matrik pembantu untuk pertimbangan karakter fasilitas.

b1. Penggabungan Matrik Karakter dengan Matrik Kedekatan 1 (δ)

Merupakan matrik perhitungan yang menghubungkan matrik karakter dengan matrik kedekatan.

δ_{11}	δ_{12}	δ_{13}	δ_{14}	δ_{15}	δ_{16}
δ_{21}	δ_{22}	δ_{23}	δ_{24}	δ_{25}	δ_{26}
δ_{31}	δ_{32}	δ_{33}	δ_{34}	δ_{35}	δ_{36}
δ_{41}	δ_{42}	δ_{43}	δ_{44}	δ_{45}	δ_{46}
δ_{51}	δ_{52}	δ_{53}	δ_{54}	δ_{55}	δ_{56}
δ_{61}	δ_{62}	δ_{63}	δ_{64}	δ_{65}	δ_{66}

Gambar 8.12 Matrik δ

Perhitungan :

$$\delta_{ij} = \alpha\ \theta_i\mu_i\ \beta\ \theta_j\mu_j$$

b2. Penggabungan Matrik Karakter dengan Matrik Kedekatan 2 (γ)

Merupakan matrik pertimbangan karakter yang dapat dihubungkan langsung dengan matrik X.

γ_{11}	γ_{12}	γ_{13}	γ_{14}	γ_{15}	γ_{16}
γ_{21}	γ_{22}	γ_{23}	γ_{24}	γ_{25}	γ_{26}
γ_{31}	γ_{32}	γ_{33}	γ_{34}	γ_{35}	γ_{36}
γ_{41}	γ_{42}	γ_{43}	γ_{44}	γ_{45}	γ_{46}
γ_{51}	γ_{52}	γ_{53}	γ_{54}	γ_{55}	γ_{56}
γ_{61}	γ_{62}	γ_{63}	γ_{64}	γ_{65}	γ_{66}

Gambar 8.13 Matrik γ

Perhitungan :

γ_{ij} = (Abs((2* δ_{ij})+1)) MOD 3

c. Pembuatan Matrik Gabungan (X)

Matrik X	12	13	14	23	24	34
AB	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}
AC	X_{21}	X_{22}	X_{23}	X_{24}	X_{25}	X_{26}
AD	X_{31}	X_{32}	X_{33}	X_{34}	X_{35}	X_{36}
BC	X_{41}	X_{42}	X_{43}	X_{44}	X_{45}	X_{46}
BD	X_{51}	X_{52}	X_{53}	X_{54}	X_{55}	X_{56}
CD	X_{61}	X_{62}	X_{63}	X_{64}	X_{65}	X_{66}

Gambar 8.14 Matrik X

d. Matrik Penempatan Optimal (Y)

Matrik Y	A	B	C	D
1	Y_{11}	Y_{12}	Y_{13}	Y_{14}
2	Y_{21}	Y_{22}	Y_{23}	Y_{24}
3	Y_{31}	Y_{32}	Y_{33}	Y_{34}
4	Y_{41}	Y_{42}	Y_{43}	Y_{44}

Gambar 8.15 Matrik Y

e. Matrik pembantu :

Matrik λ :

λ_{11}	λ_{12}	λ_{13}
λ_{21}	λ_{22}	λ_{23}
λ_{31}	λ_{32}	λ_{33}
λ_{41}	λ_{42}	λ_{43}

Gambar 8.16 Matrik N

$\lambda_{ij} = (i)\ N3 + (j+1) - i - N3 - \sum_{z} Z$

$\forall i \in n3 \qquad \forall j \in (i <= j, j <= N3) \qquad z>=0 \text{ and } z<=i-2$

$\lambda_{ij} = (j)\ N3 + (i) - j \quad - N3 - \sum_{z} Z$

$\forall j \in n3 \qquad \forall i \in (j+1 <= i, i <= N3) \qquad z>=0 \text{ and } z<=j-2$

N3 = jumlah kolom matrik N = N1 – 1

n3 = 1,2,3,…,N3

Matrik θ :

θ_1	θ_2	θ_3	θ_4	θ_5	θ_6

Gambar 8.17 Matrik θ

Keterangan : untuk nilai matrik θ dapat dilihat pada tabel di lampiran

Matrik μ :

μ_1	μ_2	μ_3	μ_4	μ_5	μ_6

Gambar 8.18 Matrik μ

Keterangan : untuk nilai matrik μ dapat dilihat pada tabel di lampiran

f. Pembuatan Model Matematis

Notasi yang digunakan :

N1 = jumlah kolom matrik Y

N2 = jumlah kolom matrik X

n1 = 1,2,3,...,N1

n2 = 1,2,3,...,N2

Fungsi tujuan :

Min =

$$\sum_{i=1}^{N1}\sum_{j=1}^{N1} Y_{\theta_j \theta_i} Y_{\mu_j \mu_i} \sum_{i=1}^{N1}\sum_{j=1}^{N1} Y_{\mu_j \theta_i} Y_{\theta_j \mu_i} \quad \text{.....(3.1)}$$

$\forall i \subset n1$ $\forall j \subset n1$

Fungsi pembatas :

$$\sum_{i=1}^{N2} X_{ij} = 1 \quad \text{.....(3.2)}$$

$\forall j \subset n2$

$$\sum_{j=1}^{N2} X_{ij} = 1 \quad \text{.....(3.3)}$$

$\forall j \subset n2$

$$\sum_{i=1}^{N1} Y_{ij} = 1 \quad \text{.....(3.4)}$$

$\forall i \subset n1$

$$\sum_{j=1}^{N1} Y_{ij} = 1 \quad \text{.....(3.5)}$$

$\forall j \subset n1$

$$(N1\text{-}1)Y_{ij} = \sum_{k=1}^{(N1-1)}\sum_{p=1}^{(N1-1)} X_{\lambda_{jk} \lambda_{ip}} \quad \text{.....(3.6)}$$

$\forall i \subset n1 \qquad \forall j \subset n1$

$Y_{ij} >= 0$ .....(3.7)

$\forall i \subset n1 \qquad \forall j \subset n1$

$Y_{ij} <= i'$ .....(3.8)

$\forall i \subset n1 \qquad \forall j \subset n1$

$Y_{ij} <= \rho_{ij}$ .....(3.9)

$\forall i \subset n1 \qquad \forall j \subset n1$

$X_{ij} >= 0$ .....(3.10)

$\forall i \subset n2 \qquad \forall j \subset n2$

$X_{ij} <= 1$ .....(3.11)

$\forall i \subset n2 \qquad \forall j \subset n2$

$X_{ij} <= \gamma_{ij}$ .....(3.12)

$\forall i \subset n2 \qquad \forall j \subset n2$

INT Y_{ij} .....(3.13)

$\forall i \subset n1 \qquad \forall j \subset n1$

INT X_{ij} .....(3.14)

$\forall i \subset n2 \qquad \forall j \subset n2$

Keterangan :

Persamaan (3.1) : Menyatakan fungsi tujuan yang meminimasi nilai total perpindahan berdasarkan pertimbangan nilai frekuensi, jarak, dan nilai konversi (telah dihitung dalam matrik θ, ψ, σ dan τ).

Persamaan (3.2) : Menyatakan tiap lokasi hanya dapat dialokasikan pada satu fasilitas saja.

Persamaan (3.3) : Menyatakan tiap fasilitas hanya dapat dialokasikan pada satu lokasi saja.

Persamaan (3.4) : Menyatakan tiap lokasi hanya dapat dialokasikan pada satu fasilitas saja.

Persamaan (3.5) : Menyatakan tiap fasilitas hanya dapat dialokasikan pada satu lokasi saja.

Persamaan (3.6) : Menghubungkan antara Matrik Pengalokasian (X) dengan Matrik Penempatan Optimal (Y), sehingga dapat diketahui pengalokasian tiap fasilitas.

Persamaan (3.7) : Menyatakan Y merupakan variable binary

Persamaan (3.8) : Menyatakan Y merupakan variable binary

Persamaan (3.9) : Menghubungkan matrik Y dengan matrik P, yang menyatakan suatu fasilitas dapat dialokasikan pada suatu lokasi tertentu.

Persamaan (3.10) : Menyatakan X merupakan variable binary

Persamaan (3.11) : Menyatakan X merupakan variable binary

Persamaan (3.12) : Menghubungkan matrik X dengan matrik M, yang mempertimbangkan karakter fasilitas dalam melakukan pengalokasian.

Persamaan (3.13) : Menyatakan Y merupakan variable binary

Persamaan (3.14) : Menyatakan X merupakan variable binary

8.3 Output :

a. Pempatan yang optimal

Penempatan fasilitas yang yang optimal dapat dilihat pada Matik Penempatan Optimal (Y).

b. Perhitungan biaya optimal

Biaya Optimal didapatkan dari perhitungan nilai fungsi tujuan.

LAMPIRAN 3
TABEL MATRIK θ dan MATRIK μ

Untuk 3 lokasi :

Matrik θ	1	1	2
Matrik μ	2	3	3

Untuk 4 Lokasi :

Matrik θ	1	1	1	2	2	3
Matrik μ	2	3	4	3	4	4

Untuk 5 Lokasi :

Matrik θ	1	1	1	1	2	2	2	3	3	4
Matrik μ	2	3	4	5	3	4	5	4	5	5

Untuk 6 Lokasi :

Matrik θ	1	1	1	1	1	2	2	2	2	3	3	3	4	4	5
Matrik μ	2	3	4	5	6	3	4	5	6	4	5	6	5	6	6

Keterangan :

Matrik θ dan μ merupakan matrik yang berisi nilai kombiasi dari lokasi penempatan pada matrik X. Hal ini dapat dilihat dari susunan nilai pada tabel – tabel diatas.

LAMPIRAN 4
PROGRAM PBLP
dengan
BAHASA PEMROGRAMAN PASCAL

```
Uses Wincrt;
Var
U : array [1..30,1..30] of real;
V : array [1..30,1..30] of real;
S : array [1..30,1..30] of real;
T : array [1..30,1..30] of real;
M : array [1..30,1..30] of integer;
K : array [1..30,1..30] of integer;
X : array [1..30,1..30] of integer;
q : array [1..30] of integer;
r : array [1..30] of integer;
Y : array [1..8,1..8] of integer;
Yo : array [1..8,1..8] of integer;
D : array [1..8,1..8] of real;
F : array [1..8,1..8] of integer;
A : array [1..8,1..8] of integer;
B : array [1..8,1..8] of integer;
P : array [1..8,1..8] of integer;
C : array [1..8,1..8] of real;
N : array [1..8,1..8] of integer;
Ba : array [1..30,1..8] of integer;
dd,e,i,j,o,pp,vv,w,z,valid,N1,N2: integer;
nilaiA,nilaiB: real;

Procedure Cetak;
Begin
    Clrscr;
    Write ('Urutan Posisi Optimal : ');
    For i:= 1 to N1 do
    For j:=1 to N1 do
    If Yo[i,j]=1 then write(j, ' ');
    Writeln;
    Writeln('Nilai Perhitungan : ', nilaiA);
    Readln;
End;
Procedure Minimize;
Begin
    nilaiB:=0; {nilai baru}
    For i:= 1 to N2 do
```

```
    For j:=1 to N2 do
    nilaiB:=nilaiB+ ((U[i,j]+V[i,j])*Y[q[j],q[i]]*Y[r[j],r[i]]);
    For i:= 1 to N2 do
    For j:=1 to N2 do
    nilaiB:=nilaiB+ ((S[i,j]+T[i,j])*Y[r[j],q[i]]*Y[q[j],r[i]]);
    if nilaiB<nilaiA then
    Begin
        for i:=1 to N1 do
        for j:=1 to N1 do
        Yo[i,j]:=Y[i,j];
        nilaiA:=nilaiB; {jika nilai baru lebih baik maka jadi nilai optimal}
    End;
End;
Procedure Karakter;
Begin
    Valid:=1;
    For i:=1 to N2 do
    For j:=1 to N2 do
    If  X[i,j] >K[i,j] then valid := 0;
    If valid=1 then Minimize;
End;
Procedure AcakX;
Var k,l : integer;
Begin
    pp:=0;
    For i:=1 to N1 do
    For j:=1 to N1 do
    If Y[i,j]=1 then
    Begin
        pp:=pp+1;
        Ba[pp,5]:=i;
        Ba[pp,6]:=j;
    End;
    For i:=1 to (N1-1) do
    For j:=i+1 to N1 do
    For k:=1 to N2 do
    If Ba[i,5]=Ba[k,1] then
    If Ba[j,5]=Ba[k,2] then
    For l:=1 to N2 do
    If Ba[i,6]=Ba[l,1] then
    If Ba[j,6]=Ba[l,2] then
    X[l,k]:=1;
    For i:=1 to (N1-1) do
    For j:=i+1 to N1 do
    For k:=1 to N2 do
    If Ba[i,5]=Ba[k,1] then
```

```
    If Ba[j,5]=Ba[k,2] then
    For l:=1 to N2 do
    If Ba[j,6]=Ba[l,1] then
    If Ba[i,6]=Ba[l,2] then
    X[l,k]:=1;
    For i:=1 to (N1-1) do
    For j:=i+1 to N1 do
    For k:=1 to N2 do
    If Ba[j,5]=Ba[k,1] then
    If Ba[i,5]=Ba[k,2] then
    For l:=1 to N2 do
    If Ba[j,6]=Ba[l,1] then
    If Ba[i,6]=Ba[l,2] then
    X[l,k]:=1;
    For i:=1 to (N1-1) do
    For j:=i+1 to N1 do
    For k:=1 to N2 do
    If Ba[j,5]=Ba[k,1] then
    If Ba[i,5]=Ba[k,2] then
    For l:=1 to N2 do
    If Ba[i,6]=Ba[l,1] then
    If Ba[j,6]=Ba[l,2] then
    X[l,k]:=1;
    Karakter;
    For i:=1 to N2 do
    For j:=1 to N2 do
    X[i,j]:=0;
End;
Procedure Peletakan;
Begin
    Valid:=1;
    For i:=1 to N1 do
    For j:=1 to N1 do
    If  Y[i,j] >P[i,j] then valid := 0;
    If valid=1 then AcakX;
End;
Procedure AcakY;
Var a: integer;
Begin
 For a:=1 to N1 do
 If z=N1+1  then
 Begin
     If a=1 then
     Begin
         w:=0;
         For dd:=1 to N1 do
```

```
          Begin
               vv:=0;
               For e:=1 to N1 do
               vv :=vv + Y[dd,e];
               If vv<>1 then
               w:=1;
          End;
           If w=0 then
           Peletakan;
        End
 End
 Else
 Begin
  Y[a,z]:=1;
  z:=z+1;
  AcakY;
  z:=z-1;
  Y[a,z]:=0;
 End;
End;
Procedure matrikK;
Begin
    For i:=1 to N2 do
    For j:=1 to N2 do
    K[i,j]:=(Abs((2*M[I,j])+1)) mod 3;
End;
Procedure matrikM;
Begin
    For i:=1 to N2 do
    For j:=1 to N2 do
    M[i,j]:=A[Ba[i,1],Ba[i,2]]* B[Ba[j,1],Ba[j,2]];
End;
Procedure matrikV;
Begin
    For i:=1 to N2 do
    For j:=1 to N2 do
    V[i,j]:=F[Ba[i,3],Ba[i,4]]* D[Ba[j,3],Ba[j,4]]* C[Ba[i,3],Ba[i,4]];
End;
Procedure matrikU;
Begin
    For i:=1 to N2 do
    For j:=1 to N2 do
    U[i,j]:=F[Ba[i,1],Ba[i,2]]* D[Ba[j,1],Ba[j,2]]* C[Ba[i,1],Ba[i,2]];
End;
Procedure matrikbantu;
Begin
```

```
    z:=1;
    For o:=1 to N1-1 do
    For pp:=o+1 to N1 do
    Begin
        Ba[z,1]:=o;
        Ba[z,2]:=pp;
        Ba[z,3]:=pp;
        Ba[z,4]:=o;
        z:=z+1;
    End;
End;

Procedure matrikN;
Begin
    For i:= 1 to (N1-1) do
    For j:= i to (N1-1) do
    Begin
        pp:=0;
        For o:=0 to (i-2) do pp:=pp+o;
        N[i,j]:=(i * (N1-1)) +(j+1)-i-(N1-1)-pp;
    End;
    For j:= 1 to (N1-1) do
    For i:= j+1 to N1 do
    Begin
        pp:=0;
        For o:=0 to (j-2) do pp:=pp+o;
        N[i,j]:=(j * (N1-1)) +(i)-j-(N1-1)-pp;
    End;
End;
Procedure Input;
Begin
    Write ('Jumlah Fasilitas : ');readln(N1);
    N2:=0;
    For i:=1 to (N1-1) do N2:=N2+i;
    {matrikD}
    Clrscr;
    Writeln ('Nilai Matrik D : ');
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(D[i,j]);
    End;
    {MatrikF}
    Clrscr;
    Writeln ('Nilai Matrik F : ');
```

```
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(F[i,j]);
    End;
    {MatrikA}
    Clrscr;
    Writeln ('Nilai Matrik A : ');
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(A[i,j]);
    End;
    {matrikB}
    Clrscr;
    Writeln ('Nilai Matrik B : ');
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(B[i,j]);
    End;
    {MatrikP}
    Clrscr;
    Writeln ('Nilai Matrik P : ');
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(P[i,j]);
    End;
    {matrikC}
    Clrscr;
    Writeln ('Nilai Matrik C : ');
    for i:=1 to N1 do
    for j:=1 to N1 do
    Begin
        Gotoxy(j*3,i*3);
        Read(C[i,j]);
    End;
End;
```

```
{Program Dasar}
Begin
 nilaiA:=99999; {nilai yang sangat besar sebagai pembanding awal}
 input;
 matrikN;
 matrikbantu;
 matrikU;
 matrikV;
 matrikM;
 matrikK;
 z:=1;
 AcakY;
 Cetak;
End.
```