

เอกสารอ้างอิง



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0001:    INTEGER BLANK(28000)
0002:    COMMON /BUFF/ BLANK
0003:    DO 10 I=1,28000
0004:    BLANK(I)=0
0005:  10 CONTINUE
0006:    CALL STEP1A
0007:    CALL STEP1B
0008:    CALL STEP2A
0009:    CALL STEP2B
0010:    CALL STEP3
0011:    CALL STEP4
0012:    CALL STEP5
0013:    CALL STEP6
0014:    STOP
0015:    END
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LPL

PROGRAM SIZE: 0038 DATA POOL SIZE: 0004 ERROR COUNT: 0000

מחלקת המחקר והפיתוח

ח. כהן

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0001:      SUBROUTINE STEPIA
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTO(20),CUTF(20)
0008:      COMPLEX CUTZ(20)
0009:      INTEGER BUS(100),BUSZON(20,5),LINE(200),NP(200),NQ(200)
0010:      REAL    BC(200),T(200),BASEKV(100)
0011:      COMPLEX ZPRI(200)
0012:      DOUBLE PRECISION BUSNAM(100)
0013:      INTEGER BLANK1(1780)
0014:      INTEGER ZONE(100),NPD(200),NQD(200)
0015:      REAL    BCS(100)
0016:      COMPLEX ZPRID(200),YT(100)
0017:      INTEGER BLANK2(6100)
0018:      INTEGER TYPE(100),NPZ(100,5),NQZ(100,5)
0019:      REAL    VOLT(100),VARMAX(100),VARMIN(100),STATC(100)
0020:      COMPLEX GEN(100),LOAD(100),ZRX(100,5)
0021: C
0022:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0023: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0024: X,      CUTP,CUTO,CUTF,CUTZ
0025: X,      BUS,BUSZON,LINE,NP,NQ,BC,T,BASEKV,ZPRI,BUSNAM
0026: X,      BLANK1,ZONE,NPD,NQD,BCS,ZPRID,YT,BLANK2
0027: X,      TYPE,NPZ,NQZ,VOLT,VARMAX,VARMIN,STATC,GEN,LOAD,ZRX
0028: C
0029:      IWRITE=1
0030:      IREAD=2
0031: C
0032:      READ(IREAD,105) NOZONE,NOBUS,NOLINE,MAXITE,BASMVA,ACC,TOR,
0033: X          (OPTION(I),I=1,15)
0034: 105 FORMAT(4I5,3F10.0,5X,15I1)
0035: C
0036:      DO 110 I=1,NOBUS
0037:      READ(IREAD,107) BUSNAM(I),BUS(I),ZONE(I),TYPE(I),BASEKV(I),VOLT(I)
0038: X,      GEN(I),LOAD(I),VARMAX(I),VARMIN(I),STATC(I)
          LPL
0039: 107 FORMAT(A8,3I4,12F5.2)
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0040:      VOLT(I)=VOLT(I)/BASEKV(I)
0041:      IF(VOLT(I).EQ.0.0) VOLT(I)=1.0
0042: 110 CONTINUE
0043: C
0044: C
0045: C
0046:      DO 120 J=1,NOZONE
0047:      NOBUSZ(J)=0
0048:      DO 120 I=1,NOBUS
0049:      IF(ZONE(I).NE.J) GO TO 120
0050:      NOBUSZ(J)=NOBUSZ(J)+1
0051:      K=NOBUSZ(J)
0052:      BUSZON(K,J)=BUS(I)
                                         LPL
0053: 120 CONTINUE
0054: C
0055: C
0056:      DO 130 I=1,NOLINE
0057:      READ(IREAD,125) LINE(I),NP(I),NQ(I),ZPRI(I),BC(I),T(I)
0058: 125 FORMAT(3I5,5X,4F10.8)
0059:      IF(T(I).EQ.0.0) T(I)=1.0
0060: 130 CONTINUE
0061: C
                                         LPL
0062:      IL=0
0063:      NOCUT=0
0064: 132 CONTINUE
0065: C
0066:      DO 150 I=1,NOLINE
0067:      DO 134 IP=1,NOBUS
0068:      IF(NP(I).EQ.BUS(IP)) GO TO 136
0069: 134 CONTINUE
0070: 136 CONTINUE
0071: C
0072: C
0073:      DO 138 IO=1,NOBUS
0074:      IF(NQ(IO).EQ.BUS(IO)) GO TO 140
0075: 138 CONTINUE
0076: 140 CONTINUE
0077: C
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0078:      IF(ZONE(IP).NE.ZONE(IO)) GO TO 146
0079: C
0080:      IL=IL+1
0081:      NPD(IL)=NP(I)
0082:      NQD(IL)=NQ(I)
0083: C
0084:      IF(T(I).NE.1.0) GO TO 148
0085: C
0086:      ZPRID(IL)=ZPRI(I)
0087: C
0088: 145 CONTINUE
0089:      BCS(IP)=BCS(IP)+BC(I)/2.0
0090:      BCS(IO)=BCS(IO)+BC(I)/2.0
0091:      GO TO 150
                                         LPL
0092: C
0093: C
0094: 146 CONTINUE
0095:      NOCUT=NOCUT+1
0096:      CUTP(NOCUT)=NP(I)
0097:      CUTQ(NOCUT)=NQ(I)
0098:      IF(T(I).NE.1.0) GO TO 147
0099:      CUTZ(NOCUT)=ZPRI(I)
0100:      GO TO 145
0101: C
0102: 147 CONTINUE
0103:      CUTZ(NOCUT)=ZPRI(I)*T(I)
0104:      GO TO 149
0105: C
0106: 148 CONTINUE
0107:      ZPRID(IL)=ZPRI(I)*T(I)
                                         LPL
0108: 149 CONTINUE
0109:      YT(IP)=YT(IP)+(1.0-T(I))/T(I)**2/ZPRI(I)
0110:      YT(IO)=YT(IO)+(T(I)-1.0)/T(I)/ZPRI(I)
0111: C
0112: 150 CONTINUE
0113: C
0114:      DO 190 J=1,NOZONE
0115:      NPZ(I,J)=0
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0116:      NOZ(I,J)=BUSZON(I,J)
0117:      ZRX(I,J)=CMPLX(1.0,1.0)
0118: C
0119:      NH=1
0120:      II=1
0121:      JJ=1
0122:      KK=1
0123: C

                                LPL
0124: 160 CONTINUE
0125:      IL=1
0126: 161 CONTINUE
0127:      IF(NPD(IL).EQ.9999) GO TO 180
0128: C
0129:      IF(NPD(IL).NE.0.AND.NOD(IL).NE.0) GO TO 168
0130: C
0131:      II=II+1
0132:      NPZ(II,J)=0
0133:      NOZ(II,J)=BUSZON(NH,J)
0134: C
0135:      DO 162 IQ=1,NOBUS
0136:      IF(BUS(IQ).EQ.NOZ(II,J)) GO TO 164
0137: 162 CONTINUE

                                LPL
0138: 164 CONTINUE
0139:      ZRX(II,J)=1.0/(((CONJG(LOAD(IQ))+CMPLX(0.0,STATC(IQ)))/BASMVA
0140: X          /VOLT(IQ)/VOLT(IQ)+YT(IQ)+CMPLX(0.0,BCS(IQ)))
0141: C
0142:      NH=NH+1
0143:      JJ=NH
0144: C
0145:      IF(BUSZON(NH,J).EQ.0) GO TO 185
0146:      GO TO 160
0147: C
0148: 168 CONTINUE
0149:      IF(NOD(IL).EQ.BUSZON(NH,J)) GO TO 170

                                LPL
0150:      IF(NPD(IL).NE.BUSZON(NH,J)) GO TO 180
0151: C
0152:      ND=NPD(IL)
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0153:      NPD(IL)=NOD(IL)
0154:      NOD(IL)=ND
0155: C
0156: 170 CONTINUE
0157: C
0158:      DO 172 M=1, KK
0159:      IF(NPD(IL).EQ.BUSZON(M,J)) GO TO 182
0160: 172 CONTINUE
0161: C
0162:      KK=KK+1
0163:      BUSZON(KK,J)=NPD(IL)
0164: C
0165: 180 CONTINUE
0166:      IL=IL+1
0167:      GO TO 161
0168: C
0169: 182 CONTINUE
0170:      IF(M.GE.JJ) GO TO 180
0171:      II=II+1
0172:      NPZ(II,J)=NPD(IL)
0173:      NOZ(II,J)=NOD(IL)
0174:      ZRX(II,J)=ZPRID(IL)
0175:      NPD(IL)=9999
0176:      GO TO 160
0177: C
0178: C
0179: 185 CONTINUE
0180:      II=II+1
0181:      NPZ(II,J)=0
0182:      NOZ(II,J)=NOZ(1,J)
0183:      ZRX(II,J)=CMPLX(-1.0,-1.0)
0184:      NOLINZ(J)=II
                                LPL
0185: 190 CONTINUE
0186: C
0187:      RETURN
0188:      END
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LPL

PROGRAM SIZE: 1036 DATA POOL SIZE: 0105 ERROR COUNT: 0000

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0001:      SUBROUTINE STEP1B
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTQ(20),CUTF(20)
0008:      COMPLEX CUTZ(20)
0009:      INTEGER BUS(100),BUSZON(20,5),LINE(200),NP(200),NQ(200)
0010:      REAL    BC(200),T(200),BASEKV(100)
0011:      COMPLEX ZPRI(200)
0012:      DOUBLE PRECISION BUSNAM(100)
0013:      INTEGER BLANK1(1780)
0014:      INTEGER ZONE(100),NPD(200),NOD(200)
0015:      REAL    BCS(100)
0016:      COMPLEX ZPRID(200),YT(100)
0017:      INTEGER BLANK2(6100)
0018:      INTEGER TYPE(100),NPZ(100,5),NOZ(100,5)
0019:      REAL    VOLT(100),VARMAX(100),VARMIN(100),STATC(100)
0020:      COMPLEX GEN(100),LOAD(100),ZRX(100,5)
0021: C
0022:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0023: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0024: X,      CUTP,CUTQ,CUTF,CUTZ
0025: X,      BUS,BUSZON,LINE,NP,NQ,BC,T,BASEKV,ZPRI,BUSNAM
0026: X,      BLANK1,ZONE,NPD,NOD,BCS,ZPRID,YT,BLANK2
0027: X,      TYPE,NPZ,NOZ,VOLT,VARMAX,VARMIN,STATC,GEN,LOAD,ZRX
0028:      IF(OPTION(1).EQ.0) GO TO 1991
0029: C
0030:      WRITE(IWRITE,1911)
0031:      WRITE(IWRITE,1912)
0032:      WRITE(IWRITE,1913)
0033:      WRITE(IWRITE,1914)
0034:      WRITE(IWRITE,1915)
0035:      WRITE(IWRITE,1916)
0036:      DO 191 I=1,NOBUS
0037:      WRITE(IWRITE,1918) BUS(I),ZONE(I),TYPE(I),VOLT(I),GEN(I),
0038: X          VARMAX(I),VARMIN(I),LOAD(I),STATC(I)
          LPL
0039:      IF(OPTION(13).NE.0) WRITE(IWRITE,1917)
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0079:      X      (')
0080: 1925 FORMAT(' ',20X,' NO. : P : O : R : X : SHUNT : RA
0081:      XTIO (')
0082: 1926 FORMAT(' ',20X,'-----|-----|-----|-----|-----|-----|
0083:      X----(')
0084: 1927 FORMAT(' ',20X,' : : : : : : : : : : : : : : : : : : : : : : : :
0085:      X      (')
0086: 1928 FORMAT(' ',20X,' I4,' ',2(I3,' '),3(F7.4,' '),F6.3,' ')
0087: C
0088: 1992 IF(OPTION(3).EQ.0) GO TO 1993
0089: C
0090:      WRITE(IWRITE,1931)
0091:      WRITE(IWRITE,1932)
0092:      WRITE(IWRITE,1933)
0093:      WRITE(IWRITE,1934)
0094:      WRITE(IWRITE,1935)
0095:      WRITE(IWRITE,1936)
0096:      WRITE(IWRITE,1937)
0097:      DO 193 I=1,NOCUT
0098:      WRITE(IWRITE,1939) CUTP(I),CUTO(I),CUTZ(I)
                                LPL
0099:      IF(OPTION(13).NE.0) WRITE(IWRITE,1938)
0100: 193 CONTINUE
0101:      WRITE(IWRITE,1937)
0102: C
0103: 1931 FORMAT(' ',31X,' CUT LINE ')
0104: 1932 FORMAT(' ',30X,'-----|-----|-----|-----|-----|-----|)
0105: 1933 FORMAT(' ',30X,' BETWEEN IMPEDANCE ')
0106: 1934 FORMAT(' ',30X,'-----|-----|-----|-----|-----|-----|)
0107: 1935 FORMAT(' ',30X,' BUS : BUS ')
0108: 1936 FORMAT(' ',30X,' NO. : NO. R X ')
0109: 1937 FORMAT(' ',30X,'-----|-----|-----|-----|-----|-----|)
0110: 1938 FORMAT(' ',30X,'-----|-----|-----|-----|-----|-----|)
0111: 1939 FORMAT(' ',30X,' ',2(I3,' '),2(F8.4,' '))
0112: C
0113: 1993 IF(OPTION(4).EQ.0) GO TO 1994
0114: C
0115:      DO 195 J=1,NOZONE
0116:      WRITE(IWRITE,1941) J
0117:      WRITE(IWRITE,1942)
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0113: WRITE(IWRITE,1943)
0119: WRITE(IWRITE,1944)
0120: WRITE(IWRITE,1945)
0121: WRITE(IWRITE,1946)
0122: L=NOLINZ(J)
0123: DO 194 I=1,L
0124: WRITE(IWRITE,1948) NPZ(I,J),NOZ(I,J),ZRX(I,J)
                                LPL
0125: IF(OPTION(13).NE.0) WRITE(IWRITE,1947)
0126: 194 CONTINUE
0127: WRITE(IWRITE,1946)
0128: 195 CONTINUE
0129: C
0130: 1941 FORMAT('1',31X,'LINE LIST AFTER ORDERING-ZONE',I2)
0131: 1942 FORMAT('0',30X,'|-----|-----|-----|')
0132: 1943 FORMAT(' ',30X,'| BUS | BUS | IMPEDANCE |')
0133: 1944 FORMAT(' ',30X,'|-----|-----|-----|')
0134: 1945 FORMAT(' ',30X,'| P | Q | R | X |')
0135: 1946 FORMAT(' ',30X,'|-----|-----|-----|')
0136: 1947 FORMAT(' ',30X,'|-----|-----|-----|')
0137: 1948 FORMAT(' ',30X,'|',2(I3,' '),2(F8.4,' '))
0138: C
0139: 1994 CONTINUE
0140: C
0141: RETURN
0142: END
```

LPL

PROGRAM SIZE: 0459 DATA POOL SIZE: 1021 ERROR COUNT: 0000

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```
0001:      SUBROUTINE STEP2A
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTO(20),BLANK1(100),BUS(100),NODE(20,5)
0008: X,      BLANK2(2800)
0009:      INTEGER CUTPB(20),CUTOB(20),CUTPZ(20),CUTOZ(20),TYPEZ(20,5)
0010:      REAL    VOLTZ(20,5),VAMXZ(20,5),VAMNZ(20,5),STATZ(20,5)
0011:      COMPLEX GENZ(20,5),LOADZ(20,5),Z1(20,20,5)
0012:      INTEGER TYPE(100),NPZ(100,5),NOZ(100,5)
0013:      REAL    VOLT(100),VARMAX(100),VARMIN(100),STATC(100)
0014:      COMPLEX GEN(100),LOAD(100),ZRX(100,5)
0015: C
0016:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0017: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0018: X,      CUTP,CUTO,BLANK1,BUS,NODE,BLANK2
0019: X,      CUTPB,CUTOB,CUTPZ,CUTOZ,TYPEZ,VOLTZ,VAMXZ,VAMNZ
0020: X,      STATZ,GENZ,LOADZ,Z1
0021: X,      TYPE,NPZ,NOZ,VOLT,VARMAX,VARMIN,STATC,GEN,LOAD,ZRX
0022: C
0023:      DO 240 J=1,NOZONE
0024:      K=1
0025:      N=1
0026:      Z1(K,K,J)=ZRX(N,J)
0027:      NODE(K,J)=NOZ(N,J)
0028: C
0029: 205 N=N+1
0030:      IF(NPZ(N,J).EQ.0) GO TO 230
0031:      IFP=0
0032:      IFQ=0
0033: C
0034:      DO 206 I=1,K
0035:      IF(NPZ(N,J).NE.NODE(I,J)) GO TO 206
0036:      IFP=I
0037:      GO TO 207
0038: 206 CONTINUE
0039: C
0040: 207 CONTINUE
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```
0041:      DO 209 I=1,K
0042:      IF(NPZ(N,J).NE.NODE(I,J)) GO TO 209
0043:      IFQ=I
0044:      GO TO 210
0045: 209 CONTINUE
0046: C
0047: 210 CONTINUE
0048:      IF(IFP.EQ.0) GO TO 220
                                LPL
0049:      IF(IFQ.EQ.0) GO TO 225
0050:      L=K+1
0051:      DO 213 I=1,K
0052:      ZI(I,L,J)=ZI(I,IFP,J)-ZI(I,IFQ,J)
0053:      ZI(L,I,J)=ZI(I,L,J)
0054: 213 CONTINUE
0055:      ZI(L,L,J)=ZI(IFP,L,J)-ZI(IFQ,L,J)+ZRX(N,J)
0056: 214 CONTINUE
0057: C
0058:      DO 215 I=1,K
0059:      DO 215 M=1,K
0060:      ZI(I,M,J)=ZI(I,M,J)-ZI(I,L,J)/ZI(L,L,J)*ZI(L,M,J)
                                LPL
0061: 215 CONTINUE
0062:      DO 216 I=1,L
0063:      ZI(I,L,J)=CMPLX(0.0,0.0)
0064:      ZI(L,I,J)=CMPLX(0.0,0.0)
0065: 216 CONTINUE
0066:      GO TO 205
0067: 220 K=K+1
0068:      NODE(K,J)=NPZ(N,J)
0069:      L=K-1
0070: C
0071:      DO 222 I=1,L
0072:      ZI(I,K,J)=ZI(I,IFQ,J)
0073:      ZI(K,I,J)=ZI(I,K,J)
                                LPL
0074: 222 CONTINUE
0075:      ZI(K,K,J)=ZI(IFQ,IFQ,J)+ZRX(N,J)
0076:      GO TO 205
0077: C
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0078: 225 K=K+1
0079:     NODE(K,J)=NOZ(N,J)
0080:     L=K-1
0081: C
0082:     DO 228 I=1,L
0083:     ZI(I,K,J)=ZI(I,IFP,J)
0084:     ZI(K,I,J)=ZI(I,K,J)
                                           LPL
0085: 228 CONTINUE
0086:     ZI(K,K,J)=ZI(IFP,IFP,J)+ZRX(N,J)
0087:     GO TO 205
0088: 230 CONTINUE
0089: C
0090:     IF(NOZ(N,J).EQ.0) GO TO 240
0091:     DO 231 I=1,K
0092:     IF(NOZ(N,J).NE.NODE(I,J)) GO TO 231
0093:     IFQ=I
0094:     GO TO 232
0095: C
0096: 231 CONTINUE
0097: 232 L=K+1
0098: C
0099:     DO 233 I=1,K
0100:     ZI(I,L,J)=-ZI(IFQ,I,J)
0101:     ZI(L,I,J)=ZI(I,L,J)
0102: 233 CONTINUE
0103:     ZI(L,L,J)=-ZI(IFQ,L,J)+ZRX(N,J)
0104:     GO TO 214
                                           LPL
0105: C
0106: 240 CONTINUE
0107: C
0108:     DO 245 IC=1,NO CUT
0109:     DO 244 J=1,NOZONE
0110:     K=NOBUSZ(J)
0111:     DO 244 I=1,K
0112:     IF(CUTP(IC).NE.NODE(I,J)) GO TO 243
0113:     CUTPB(IC)=I
0114:     CUTPZ(IC)=J
0115:     GO TO 244
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0116: 243 IF(CUTO(IC).NE.NODE(I,J)) GO TO 244
0117:      CUTO3(IC)=I
0118:      CUTOZ(IC)=J
0119: 244 CONTINUE
0120: 245 CONTINUE
0121: C
0122: C
0123:      DO 255 N=1,NOBUS
0124:      DO 254 J=1,NOZONE
0125:      K=NOBUSZ(J)
0126:      DO 254 I=1,K
                                LPL
0127:      IF(BUS(N).NE.NODE(I,J)) GO TO 254
0128:      TYPEZ(I,J)=TYPE(N)
0129:      VOLTZ(I,J)=VOLT(N)
0130:      VAMXZ(I,J)=VARMAX(N)
0131:      VAMNZ(I,J)=VARMIN(N)
0132:      STATZ(I,J)=STATC(N)
0133:      GENZ(I,J)=GEN(N)
0134:      LOADZ(I,J)=LOAD(N)
0135:      GO TO 255
                                LPL
0136: 254 CONTINUE
0137: 255 CONTINUE
0138: C
0139:      DO 257 J=1,NOZONE
0140:      K=NOBUSZ(J)
0141:      DO 257 I=1,K
0142:      IF(TYPEZ(I,J).NE.3) GO TO 257
0143:      ISWB=I
0144:      ISWZ=J
0145:      GO TO 258
0146: 257 CONTINUE
0147: 258 CONTINUE
0148: C
0149:      RETURN
0150:      END
```

LPL

PROGRAM SIZE: 0902

DATA POOL SIZE: 0056

ERROR COUNT: 0000

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```
0001:      SUBROUTINE STEP2B
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTO(20),CUTF(20),BLANK1(180),NODE(20,5)
0008: X,      BLANK2(4580)
0009:      COMPLEX Z1(20,20,5),Z2(20,20,5)
0010: C
0011:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0012: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0013: X,      CUTP,CUTO,CUTF,BLANK1,NODE,BLANK2,Z1,Z2
0014:      DATA BB/' BUS'/
0015: C
0016:      DO 257 J=1,NOZONE-
0017:      K=NOBUSZ(J)
0018:      DO 256 IC=1,NOCUT
0019:      DO 260 I=1,K
0020:      IF(CUTP(IC).EQ.NODE(I,J)) GO TO 261
0021:      IF(CUTO(IC).EQ.NODE(I,J)) GO TO 261
0022: 260 CONTINUE
0023:      GO TO 266
0024: 261 IF(CUTF(IC).EQ.9999) GO TO 264
0025:      DO 262 L=1,K
0026:      Z2(L,IC,J)=Z1(L,I,J)
0027: 262 CONTINUE
0028:      CUTF(IC)=9999
0029:      GO TO 266
0030: 264 CONTINUE
0031:      DO 265 L=1,K
0032:      Z2(L,IC,J)=-Z1(L,I,J)
                                LPL
0033: 265 CONTINUE
0034: 266 CONTINUE
0035: 267 CONTINUE
0036: C
0037:      IF(OPTION(5).EQ.0) GO TO 2991
0038: C
0039:      DO 291 J=1,NOZONE
```

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```
0040:      K=NOBUSZ(J)
0041:      WRITE(IWRITE,2911) J
0042:      WRITE(IWRITE,2912) ((PB,NODE(I,J)),I=1,K)
0043:      DO 291 I=1,K
0044:      WRITE(IWRITE,2923) NODE(I,J),(Z1(I,L,J),L=1,K)
                                LPL

0045: 291 CONTINUE
0046: C
0047: 2911 FORMAT('1',40X,'Z1 MATRIX FOR ZONE',I2/41X,20('='))
0048: 2912 FORMAT('0',14X,4(4X,A4,I3,11X),10(/ 15X,4(4X,A4,I3,11X)))
0049: C
0050: 2991 IF(OPTION(6).EQ.0) GO TO 2992
0051: C
0052:      DO 292 J=1,NOZONE
0053:      K=NOBUSZ(J)
0054:      WRITE(IWRITE,2921) J-
0055:      WRITE(IWRITE,2922) ((CUTP(I),CUTO(I)),I=1,NO CUT)
0056:      DO 292 L=1,K
0057:      WRITE(IWRITE,2923) NODE(L,J),(Z2(L,IC,J),IC=1,NO CUT)
0058: 292 CONTINUE
0059: C
0060: 2921 FORMAT('1',40X,'Z2 MATRIX FOR ZONE',I2/41X,20('='))
0061: 2922 FORMAT('0', 2X,'CUT BUS LINE',4(5X,I2,'-',I2,12X),10(/ 15X,4(5X,
0062:      X I2,'-',I2,12X)))
0063: 2923 FORMAT('0', 4X,'BUS',I3,4(1X,2F10.6,'J'),10(/ 11X,4(1X,2F10.6,'J')
0064:      X))
0065: C
0066: 2992 CONTINUE
0067:      RETURN
0068:      END
```

LPL

PROGRAM SIZE: 0325

DATA POOL SIZE: 0154

ERROR COUNT: 0000

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```
0001:          SUBROUTINE STEP3
0002: C
0003: C
0004:          INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,          NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:          REAL    ACC,TOR,BASHVA
0007:          INTEGER CUTP(20),CUTO(20),CUTF(20)
0008:          COMPLEX CUTZ(20)
0009:          INTEGER BLANK1(100),NODE(20,5),BLANK2(4580)
0010:          COMPLEX Z1(20,20,5),Z2(20,20,5)
0011: X,          Z4(20,20),Y4(20,20),ZS(20,5),ZDD(20,5),D(20),VECTOR(20)
0012:          COMPLEX DD
0013: C
0014:          COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0015: X,          NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASHVA
0016: X,          CUTP,CUTO,CUTF,CUTZ
0017: X,          BLANK1,NODE,BLANK2,Z1,Z2,Z4,Y4,ZS,ZDD,D,VECTOR
0018: C
0019:          DO 320 J=1,NOZONE
0020:          K=NOBUSZ(J)
0021:          DO 318 IC=1,NOCUT
0022:          DO 310 I=1,K
0023:          IF(CUTP(IC).EQ.NODE(I,J)) GO TO 311
0024:          IF(CUTO(IC).EQ.NODE(I,J)) GO TO 311
0025: 310 CONTINUE
0026:          GO TO 318
0027: 311 CONTINUE
0028:          IF(CUTF(IC).EQ.8888) GO TO 316
0029:          DO 315 L=1,NOCUT
0030:          Z4(IC,L)=Z4(IC,L)+Z2(I,L,J)
0031: 315 CONTINUE
0032:          CUTF(IC)=8888
0033:          GO TO 318
0034: 316 CONTINUE
0035:          DO 317 L=1,NOCUT
                                LPL
0036:          Z4(IC,L)=Z4(IC,L)-Z2(I,L,J)
0037: 317 CONTINUE
0038: 318 CONTINUE
0039: 320 CONTINUE
```

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```
0040:      DO 325 I=1, NOCUT
0041:      Z4(I, I)=Z4(I, I)+CUTZ(I)
0042: 325 CONTINUE
0043: C
0044: C
0045: C
0046:      Y4(I, I)=1.0/Z4(I, I)
0047:      DO 344 N=2, NOCUT
0048:      K=N-1
0049:      DO 341 I=1, K
0050:      D(I)=CMPLX(0.0, 0.0)
0051:      DO 341 J=1, K
0052:      D(I)=D(I)+Y4(I, J)*Z4(J, N)
                                         LPL
0053: 341 CONTINUE
0054:      DD=CMPLX(0.0, 0.0)
0055:      DO 342 I=1, K
0056:      DD=DD+Z4(N, I)*D(I)
0057: 342 CONTINUE
0058:      Y4(N, N)=1.0/(Z4(N, N)-DD)
0059:      DO 343 I=1, K
0060:      Y4(I, N)=-D(I)*Y4(N, N)
0061:      Y4(N, I)=Y4(I, N)
                                         LPL
0062: 343 CONTINUE
0063:      DO 344 I=1, K
0064:      DO 344 J=1, K
0065:      Y4(I, J)=Y4(I, J)-D(I)*Y4(N, J)
0066: 344 CONTINUE
0067: C
0068: C
0069:      DO 352 IC=1, NOCUT
0070:      VECTOR(IC)=CMPLX(0.0, 0.0)
0071:      DO 352 L=1, NOCUT
                                         LPL
0072:      VECTOR(IC)=VECTOR(IC)+Y4(IC, L)*Z2(ISWB, L, ISWZ)
0073: 352 CONTINUE
0074:      DO 353 J=1, NOZONE
0075:      K=NOBUSZ(J)
0076:      DO 353 I=1, K
```


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```
0077:      ZS(I, J)=CMPLX(0.0,0.0)
0078:      DO 353 L=1, NOCUT
0079:      ZS(I, J)=ZS(I, J)+Z2(I, L, J)*VECTOR(L)
0080: 353 CONTINUE
0081: C
0082: C

                                LPL
0083:      DO 360 J=1, NOZONE
0084:      K=NOBUSZ(J)
0085:      IF(J.EQ.ISWZ) GO TO 356
0086:      DO 355 I=1, K
0087:      ZS(I, J)=-ZS(I, J)
0088: 355 CONTINUE
0089:      GO TO 360
0090: 356 CONTINUE
0091:      DO 357 I=1, K
0092:      ZS(I, J)=Z1(ISWB, I, J)-ZS(I, J)
0093: 357 CONTINUE
0094: 360 CONTINUE
0095: C
0096:      DO 365 J=1, NOZONE
0097:      K=NOBUSZ(J)
0098:      DO 365 I=1, K
0099:      ZDD(I, J)=CMPLX(0.0,0.0)
0100:      DO 362 IC=1, NOCUT

                                LPL
0101:      VECTOR(IC)=CMPLX(0.0,0.0)
0102:      DO 362 L=1, NOCUT
0103:      VECTOR(IC)=VECTOR(IC)+Y4(IC, L)*Z2(I, L, J)
0104: 362 CONTINUE
0105:      DO 363 L=1, NOCUT
0106:      ZDD(I, J)=ZDD(I, J)+Z2(I, L, J)*VECTOR(L)

                                LPL
0107: 363 CONTINUE
0108: 365 CONTINUE
0109:      DO 370 J=1, NOZONE
0110:      K=NOBUSZ(J)
0111:      DO 370 I=1, K
0112: 367 ZDD(I, J)=Z1(I, I, J)-ZDD(I, J)
0113: 369 ZDD(I, J)=ZDD(I, J)-ZS(I, J)*ZS(I, J)/ZS(ISWB, ISWZ)
```

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```
0114: 370 CONTINUE
0115: C
0116: IF(OPTION(7).EQ.0) GO TO 3991
0117: C
0118: WRITE(INWRITE,3911)
                                LPL
0119: WRITE(INWRITE,3912) ((CUTP(I),CUTO(I)),I=1,NOCUT)
0120: DO 391 I=1,NOCUT
0121: WRITE(INWRITE,3913) CUTP(I),CUTO(I),(Z4(I,J),J=1,NOCUT)
0122: 391 CONTINUE
0123: C
0124: 3911 FORMAT('1',45X,'Z4 MATRIX'/45X,9('='))
0125: 3912 FORMAT('0', 2X,'CUT BUS LINE',4(5X,I2,'-',I2,12X),10('/ 15X,4(5X,
0126: X I2,'-',I2,12X))
0127: 3913 FORMAT('0', 5X,I2,'-',I2,4(1X,2F10.6,'J'),10('/ 11X,4(1X,2F10.6,'J'
0128: X))
0129: C
0130: 3991 IF(OPTION(8).EQ.0) GO TO 3992
0131: C
0132: WRITE(INWRITE,3921)
0133: WRITE(INWRITE,3912) ((CUTP(I),CUTO(I)),I=1,NOCUT)
                                LPL
0134: DO 392 I=1,NOCUT
0135: WRITE(INWRITE,3913) CUTP(I),CUTO(I),(Y4(I,J),J=1,NOCUT)
0136: 392 CONTINUE
0137: C
0138: 3921 FORMAT('1',45X,'Y4 MATRIX'/45X,9('='))
0139: 3992 CONTINUE
0140: RETURN
0141: END
```

LPL

PROGRAM SIZE: 1025

DATA POOL SIZE: 0141

ERROR COUNT: 0000



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```
0001:      SUBROUTINE STEP4
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTO(20),BLANK(200),NODE(20,5),BLANK1(2800)
0008:      INTEGER CUTPB(20),CUTOB(20),CUTPZ(20),CUTOZ(20),TYPEZ(20,5)
0009:      REAL    VOLTZ(20,5),VAMXZ(20,5),VAMNZ(20,5),STATZ(20,5)
0010:      COMPLEX GENZ(20,5),LOADZ(20,5),Z1(20,20,5),ZLN(20,5),EC(20),AC(20)
0011: X,      A(20,5),ACUT(20,5),DACUT(20,5),ET(20,5),ECUT(20,5)
0012: X,      BLANK2(1760),Y4(20,20),ZS(20,5),ZDD(20,5)
0013:      COMPLEX SUM
0014: C
0015:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0016: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0017: X,      CUTP,CUTO,BLANK,NODE,BLANK1
0018: X,      CUTPB,CUTOB,CUTPZ,CUTOZ,TYPEZ,VOLTZ,VAMXZ,VAMNZ
0019: X,      STATZ,GENZ,LOADZ,Z1,ZLN,EC,AC,A,ACUT,DACUT
0020: X,      ET,ECUT,BLANK2,Y4,ZS,ZDD
0021: C
0022: C
0023:      DO 416 J=1,NOZONE
0024:      K=NOBUSZ(J)
0025:      DO 415 I=1,K
0026:      ET(I,J)=CMPLX(VOLTZ(I,J),0.0)
0027:      ZLN(I,J)=ET(I,J)*ET(I,J)*BASMVA/CONJG(LOADZ(I,J))
0028:      IF(TYPEZ(I,J).EQ.3) GO TO 415
0029:      A(I,J)=CONJG(GENZ(I,J))/CONJG(ET(I,J))/BASMVA
                                LPL
0030:      415 CONTINUE
0031:      416 CONTINUE
0032: C
0033: C
0034:      SUM=CMPLX(0.0,0.0)
0035:      DO 420 J=1,NOZONE
0036:      K=NOBUSZ(J)
0037:      DO 420 I=1,K
0038:      IF(TYPEZ(I,J).EQ.3) GO TO 420
0039:      SUM=SUM+ZS(I,J)*A(I,J)
```

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```
0040: 420 CONTINUE
0041: A(ISWB,ISWZ)=(ET(ISWB,ISWZ)-C14)/ZS(ISWB,ISWZ)
0042: C
0043: C
0044: DO 426 J=1,NOZONE
0045: K=NOBUSZ(J)
0046: DO 425 I=1,K
0047: ECUT(I,J)=CMPLX(0.0,0.0)
0048: DO 425 L=1,K
0049: ECUT(I,J)=ECUT(I,J)+Z1(I,L,J)*A(L,J)
                                LPL
0050: 425 CONTINUE
0051: 426 CONTINUE
0052: C
0053: C
0054: DO 435 IC=1,NOCUT
0055: IP=CUTPB(IC)
0056: IQ=CUTOB(IC)
0057: JP=CUTPZ(IC)
0058: JQ=CUTOZ(IC)
0059: IF(JP.GT.JQ) GO TO 433
0060: EC(IC)=ECUT(IQ,JQ)-ECUT(IP,JP)
0061: GO TO 435
0062: 433 EC(IC)=ECUT(IP,JP)-ECUT(IQ,JQ)
                                LPL
0063: 435 CONTINUE
0064: DO 440 J=1,NOZONE
0065: K=NOBUSZ(J)
0066: DO 440 I=1,K
0067: ACUT(I,J)=CMPLX(0.0,0.0)
0068: 440 CONTINUE
0069: C
0070: DO 448 IC=1,NOCUT
0071: AC(IC)=CMPLX(0.0,0.0)
0072: DO 442 I=1,NOCUT
0073: AC(IC)=AC(IC)+Y4(IC,I)*EC(I)
0074: 442 CONTINUE
0075: IP=CUTPB(IC)
0076: IQ=CUTOB(IC)
0077: JP=CUTPZ(IC)
```

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```
0078:      JO=CUTOZ(IC)
0079:      IF(JP.GT.JQ) GO TO 445
                                LPL
0080:      ACUT(IP,JP)=ACUT(IP,JP)+AC(IC)
0081:      ACUT(IQ,JQ)=ACUT(IQ,JQ)-AC(IC)
0082:      GO TO 448
0083: 445 ACUT(IP,JP)=ACUT(IP,JP)-AC(IC)
0084:      ACUT(IQ,JQ)=ACUT(IQ,JQ)+AC(IC)
0085: 448 CONTINUE
0086:      IF(OPTION(14).EQ.0) GO TO 460
0087:      WRITE(IWRITE,4601)
                                LPL
0088:      WRITE(IWRITE,4602)
0089:      DO 450 J=1,NOZONE
0090:      K=NOBUSZ(J)
0091:      DO 450 I=1,K
0092:      WRITE(IWRITE,4603)NODE(I,J),J,ET(I,J),ECUT(I,J),A(I,J),ACUT(I,J)
0093: 450 CONTINUE
0094:      WRITE(IWRITE,4604)
0095:      DO 455 IC=1,NOCUT
0096:      WRITE(IWRITE,4605) COTP(IC),CUTO(IC),EC(IC),AC(IC)
                                LPL
0097: 455 CONTINUE
0098: 4601 FORMAT('1',5X,'INITIAL')
0099: 4602 FORMAT('0',3X,'BUS ZONE',9X,'ET',19X,'ET(0)',18X,'IT',20X,3HIT')
0100: 4603 FORMAT(' ',2I5,4(1X,2F10.6,'J'))
0101: 4604 FORMAT('0',2X,'CUT BUS LINE',7X,'EC',20X,'IC')
0102: 4605 FORMAT(' ',5X,I2,'-',I2,2(1X,2F10.6,'J'))
0103: 460 CONTINUE
0104: C
0105:      RETURN
0106:      END
```

PROGRAM SIZE: 0708

DATA POOL SIZE: 0128

ERROR COUNT: 0000

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```
0001:      SUBROUTINE STEPS
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER CUTP(20),CUTO(20),BLANK(200),NODE(20,5),BLANK1(2800)
0008:      INTEGER CUTPB(20),CUTOB(20),CUTPZ(20),CUTOZ(20),TYPEZ(20,5)
0009:      REAL    VOLTZ(20,5),VAMXZ(20,5),VAMNZ(20,5),STATZ(20,5)
0010:      COMPLEX GENZ(20,5),LOADZ(20,5),ZI(20,20,5),ZLN(20,5),EC(20),AC(20)
0011: X,      A(20,5),ACUT(20,5),DACUT(20,5),ET(20,5),ECUT(20,5)
0012: X,      BLANK2(1760),Y4(20,20),ZS(20,5),ZDD(20,5)
0013:      COMPLEX ET0,ET1,DAN,DAS,DD
0014: C
0015:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0016: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0017: X,      CUTP,CUTO,BLANK,NODE,BLANK1
0018: X,      CUTPB,CUTOB,CUTPZ,CUTOZ,TYPEZ,VOLTZ,VAMXZ,VAMNZ
0019: X,      STATZ,GENZ,LOADZ,ZI,ZLN,EC,AC,A,ACUT,DACUT
0020: X,      ET,ECUT,BLANK2,Y4,ZS,ZDD
0021: C
0022:      IF(OPTION(9).EQ.0) GO TO 502
0023:      WRITE(IWRITE,5001)
0024:      DO 500 J=1,NOZONE
0025:      I=NOLINZ(J)-NOBUSZ(J)-2
0026:      WRITE(IWRITE,5002) J,NOBUSZ(J),I
0027: 500 CONTINUE
0028:      WRITE(IWRITE,5003) NOCUT
0029:      WRITE(IWRITE,5004) NOZONE,NOBUS,NOLINE
0030:      WRITE(IWRITE,5005) BASMVA
0031:      WRITE(IWRITE,5006) ACC
0032:      WRITE(IWRITE,5007) TOR
0033: C
0034: 5001 FORMAT('1',10X,'SOLUTION MONITOR'/11X,16('='))
0035: 5002 FORMAT('0',26X,'ZONE',12,6X,16,' BUSSES',16,' BRANCHES')
0036: 5003 FORMAT('0',51X,16,' CUT LINES')
0037: 5004 FORMAT('0',26X,'TOTAL',12,' ZONES',15,' BUSSES',16,' BRANCHES')
0038: 5005 FORMAT('0',26X,'BASE MVA      =',F8.2)
0039: 5006 FORMAT('0',26X,'ACCELERATION =',F8.2)
0040: 5007 FORMAT('0',26X,'TOLERANCE   =',F12.6)
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```
0041: C
0042: WRITE(LWRITE,5010)
                                LPL
0043: WRITE(LWRITE,5011)
0044: WRITE(LWRITE,5012)
0045: WRITE(LWRITE,5013)
0046: WRITE(LWRITE,5014)
0047: C
0048: 5010 FORMAT('0',20X,':-----:-----:-----:/'
0049: X)
0050: 5011 FORMAT(' ',20X,': ITERATION: SWING MACHINE GENERATION : CHANGES IN :/'
0051: X)
0052: 5012 FORMAT(' ',20X,': :-----: SWING BUS :/'
0053: X)
0054: 5013 FORMAT(' ',20X,': COUNT : MW : MVAR : CURRENT(PU) :/'
0055: X)
0056: 5014 FORMAT(' ',20X,':-----:-----:-----:-----:/'
0057: X)
0058: 5015 FORMAT(' ',20X,': : : : :/'
0059: X)
0060: 5016 FORMAT(' ',20X,': ',I6,' : ',2(F11.4,' '),F10.6,' ')
0061: 5017 FORMAT('0',10X,'SUCCESSFUL SOLUTION REACHED')
0062: 5018 FORMAT('0',10X,'CONVERGENCE NOT OBTAINED')
0063: C
0064: 502 CONTINUE
0065: ITERN=C
0066: C
0067: 501 DASSUM=1.0
0068: C
0069: C
0070: DO 560 I=1,NOZONE
0071: K=NORUSE(I,J)
0072: DO 560 I=1,K
0073: IF(TYPE(I,J).EQ.3) GO TO 560
0074: ET0=CMPLX(0.0,0.0)
0075: ET1=CMPLX(0.0,0.0)
0076: DO 510 I=1,K
0077: ET0=ET0-ZI(N,I,J)*A(I,J)
0078: ET1=ET1-ZI(N,I,J)*ACUT(I,J)
0079: 510 CONTINUE
```

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```
0080:      ET(N,J)=ETO+ETI
0081: C
0082: C
0083:      ECUT(N,J)=ETO
0084: C
0085:      IF(TYPEZ(N,J).NE.2) GO TO 528
                                LPL
0086: C
0087:      ETO=VOLTZ(N,J)/CABS(ET(N,J))*ET(N,J)
0088:      DAN=(ETO-ET(N,J))/ZDD(N,J)
0089:      OGN=AIMAG((ETO*CONJG(A(N,J)+DAN)-CABS(ETO)**2
0090: X      /CONJG(ZLN(N,J)))*BASMVA+LOADZ(N,J))
0091:      IF(OGN.LE.VAMXZ(N,J).AND.OGN.GE.VAMNZ(N,J)) GO TO 527
                                LPL
0092:      IF(OGN.GT.VAMXZ(N,J)) OGN=VAMXZ(N,J)
0093:      IF(OGN.LT.VAMNZ(N,J)) OGN=VAMNZ(N,J)
                                LPL
0094:      GENZ(N,J)=CMPLX(REAL(GENZ(N,J)),OGN)
0095:      GO TO 528
0096: 527 CONTINUE
0097:      ET(N,J)=ETO
0098:      GENZ(N,J)=CMPLX(REAL(GENZ(N,J)),OGN)
0099: C
0100: 528 CONTINUE
0101: C
0102:      DAN=CONJG((GENZ(N,J)-LOADZ(N,J))/BASMVA/
0103: X      ET(N,J)+CONJG(ET(N,J))/CONJG(ZLN(N,J)))-A(N,J)
0104: C
                                LPL
0105: 529 CONTINUE
0106:      DAN=ACC*DAN
0107:      A(N,J)=A(N,J)+DAN
0108:      DAS=-ZS(N,J)/ZS(ISWB,ISWZ)*DAN
0109:      A(ISWB,ISWZ)=A(ISWB,ISWZ)+DAS
0110:      DO 532 I=1,K
0111:      ECUT(I,J)=ECUT(I,J)+ZI(N,I,J)*DAN
                                LPL
0112: 532 CONTINUE
0113:      KK=NOBUSZ(ISWZ)
0114:      DO 533 I=1,KK
```

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```
0115:      ECUT(I,ISWZ)=ECUT(I,ISWZ)+Z1(ISWB,I,ISWZ)*DAS
0115: 533 CONTINUE
0117:      DO 540 IC=1,NOCUT
0118:      IP=CUTPB(IC)
0119:      IQ=CUTOB(IC)
0120:      JP=CUTPZ(IC)
0121:      JQ=CUTOZ(IC)
0122:      IF(JP.GT.JQ) GO TO 538
0123:      EC(IC)=ECUT(IQ,JQ)-ECUT(IP,JP)
0124:      GO TO 540
                                LPL
0125: 538 EC(IC)=ECUT(IP,JP)-ECUT(IQ,JQ)
0126: 540 CONTINUE
0127: C
0128:      DO 541 JJ=1,NOZONE
0129:      KK=NOBUSZ(JJ)
0130:      DO 541 I=1,KK
0131:      DACUT(I,JJ)=CMPLX(0.0,0.0)
0132: 541 CONTINUE
0133: C
0134:      DO 546 IC=1,NOCUT
0135:      AC(IC)=CMPLX(0.0,0.0)
0136:      DO 542 I=1,NOCUT
                                LPL
0137:      AC(IC)=AC(IC)+Y4(IC,I)*EC(I)
0138: 542 CONTINUE
0139: C
0140:      IP=CUTPB(IC)
0141:      IQ=CUTOB(IC)
0142:      JP=CUTPZ(IC)
0143:      JQ=CUTOZ(IC)
0144:      IF(JP.GT.JQ) GO TO 544
0145:      DACUT(IP,JP)=DACUT(IP,JP)+AC(IC)
0146:      DACUT(IQ,JQ)=DACUT(IQ,JQ)-AC(IC)
0147:      GO TO 546
                                LPL
0148: 544 DACUT(IP,JP)=DACUT(IP,JP)-AC(IC)
0149:      DACUT(IQ,JQ)=DACUT(IQ,JQ)+AC(IC)
0150: 546 CONTINUE
0151:      DO 550 JJ=1,NOZONE
```

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```
0152:      KK=NOBUSZ(JJ)
0153:      DO 550 I=1, KK
0154:      DACUT(I, JJ)=DACUT(I, JJ)-ACUT(I, JJ)
0155:      ACUT(I, JJ)=ACUT(I, JJ)+DACUT(I, JJ)
                                LPL
0156:      550 CONTINUE
0157:      C
0158:      C
0159:      DO 552 I=1, K
0160:      ET(N, J)=ET(N, J)+Z1(N, I, J)*DACUT(I, J)
0161:      552 CONTINUE
0162:      ET(N, J)=ET(N, J)+Z1(N, N, J)*DAN
0163:      IF(J.EQ.ISWZ) ET(N, J)=ET(N, J)+Z1(N, ISWB, J)*DAS
                                LPL
0164:      DASSUM=DASSUM+CABS(DAS)
0165:      560 CONTINUE
0166:      C
0167:      C
0168:      DD=ET(ISWB, ISWZ)*CONJG(A(ISWB, ISWZ))*BASMVA
0169:      ITERN=ITERN+1
0170:      IF(OPTION(9).EQ.0) GO TO 562
0171:      WRITE(IWRITE,5016) ITERN, DD, DASSUM
0172:      IF(OPTION(13).NE.0) WRITE(IWRITE,5015)
0173:      562 CONTINUE
0174:      IF(OPTION(14).EQ.0) GO TO 570
0175:      WRITE(IWRITE,5701) ITERN
                                LPL
0176:      WRITE(IWRITE,5702)
0177:      DO 565 J=1, NOZONE
0178:      K=NOBUSZ(J)
0179:      DO 565 I=1, K
0180:      WRITE(IWRITE,5703) NODE(I, J), J, ET(I, J), ECUT(I, J), A(I, J), ACUT(I, J)
0181:      565 CONTINUE
0182:      WRITE(IWRITE,5704)
0183:      DO 567 IC=1, NOCUT
0184:      WRITE(IWRITE,5705) CUTP(IC), CUTQ(IC), EC(IC), AC(IC)
                                LPL
0185:      567 CONTINUE
0186:      5701 FORMAT('0',5X,' ITERATION',I3)
0187:      5702 FORMAT('0',3X,' BUS ZONE',9X,' ET',19X,' ET(0)',18X,' IT',20X,3HIT')
```

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```
0183: 5703 FORMAT(' ',2I5,4(1X,2F10.6,'J'))
0189: 5704 FORMAT('0',2X,'CUT BUS LINE',7X,'EC',20X,'IC')
0190: 5705 FORMAT(' ',5X,I2,'-',I2,2(1X,2F10.6,'J'))
0191: 570 CONTINUE
0192: IF(DASSUM.LT.TOR) GO TO 590
0193: C
0194: IF(ITERN.LT.MAXITE) GO TO 501
0195: C
0196: IF(OPTION(9).EQ.0) RETURN
0197: WRITE(IWRITE,5014)
0198: WRITE(IWRITE,5018)
0199: C
0200: RETURN
0201: C
0202: 590 GENZ( ISWB, ISWZ)=DD
0203: IF(OPTION(9).EQ.0) RETURN
0204: WRITE(IWRITE,5014)
0205: WRITE(IWRITE,5017)
0206: RETURN
0207: END
```

LPL

PROGRAM SIZE: 1503 DATA POOL SIZE: 0585 ERROR COUNT: 0000

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```
0001:      SUBROUTINE STEP6
0002: C
0003: C
0004:      INTEGER IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0005: X,      NOBUSZ(5),NOLINZ(5),MAXITE,OPTION(15)
0006:      REAL    ACC,TOR,BASMVA
0007:      INTEGER BLANK1(140),BUS(100),NODE(20,5),LINE(200),NP(200),NO(200)
0008:      REAL    BC(200),T(200),BASEKV(100)
0009:      COMPLEX ZPRI(200)
0010:      DOUBLE PRECISION BUSNAM(100)
0011:      INTEGER BLANK2(80),TYPEZ(20,5),BLANK3(600)
0012:      REAL    STATZ(20,5)
0013:      COMPLEX GENZ(20,5),LOADZ(20,5),BLANK4(2440),ET(20,5)
0014:      COMPLEX FLOWP,FLOWQ,FLOSS,SUMLOS,SUMGEN,SUMLOD,MISMAT
0015: C
0016:      COMMON /BUFF/ IREAD,IWRITE,NOZONE,NOBUS,NOLINE,NOCUT,ISWB,ISWZ
0017: X,      NOBUSZ,NOLINZ,MAXITE,OPTION,ACC,TOR,BASMVA
0018: X,      BLANK1,BUS,NODE,LINE,NP,NO,BC,T,BASEKV,ZPRI,BUSNAM
0019: X,      BLANK2,TYPEZ,BLANK3,STATZ,GENZ,LOADZ,BLANK4,ET
0020: C
0021:      SUMGEN=CMPLX(0.0,0.0)
0022:      SUMLOD=CMPLX(0.0,0.0)
0023:      SUMSTC=0.0
0024:      IF(OPTION(10).EQ.0) GO TO 6991
0025:      WRITE(IWRITE,6001)
0026:      WRITE(IWRITE,6002)
0027:      WRITE(IWRITE,6003)
0028:      WRITE(IWRITE,6004)
0029:      WRITE(IWRITE,6005)
0030:      WRITE(IWRITE,6006)
0031: 6001 FORMAT('1',35X,'OUTPUT BUS VOLTAGE AND GENERATION')
0032: 6002 FORMAT('0', 3X,'|-----|-----|')
0033: X-|-----|-----|')
0034: 6003 FORMAT(' ', 3X,'| BUS IDENTIFICATION | BUS VOLTAGE
0035: X | GENERATION | LOAD | STATICS:')
0036: 6004 FORMAT(' ', 3X,'|-----|-----|')
0037: X-|-----|-----|')
0038: 6005 FORMAT(' ', 3X,'| NAME | NO. | ZONE | TYPE | PU | KV | DEG
0039: X | MW | MVAR | MW | MVAR | MVAR |')
0040: 6006 FORMAT(' ', 3X,'|-----|-----|-----|-----|-----|-----|')
```


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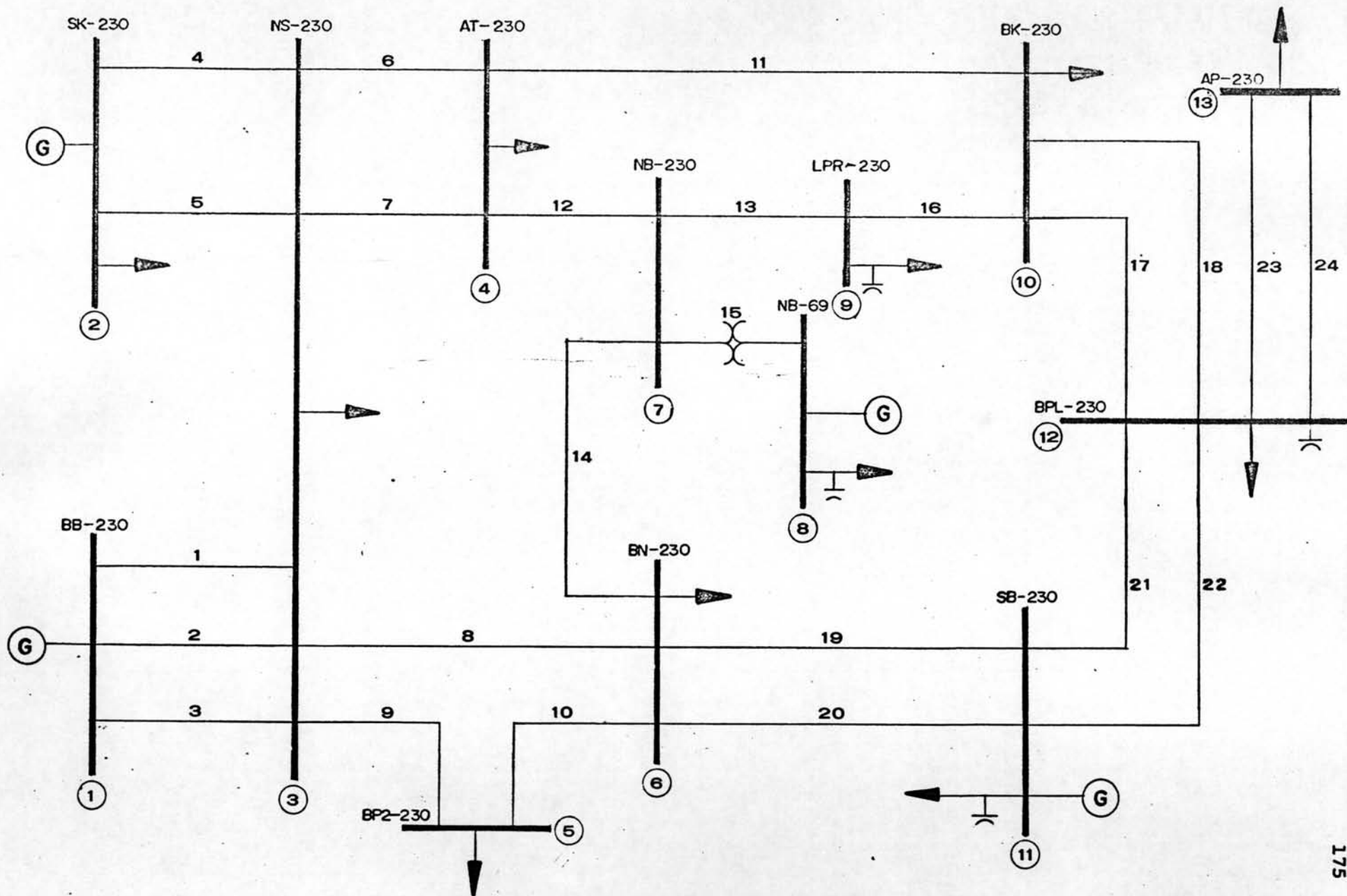
```
0117:      X      +ET(IO,JQ)* CMPLX(0.0,BC(L))/2.0)*BASMVA
0118:      CHARG=(CABS(ET(IP,JP))*2+CABS(ET(IO,JQ))*2)*BC(L)/2.0*BASMVA
0119:      FLOSS=FLOWP+FLOWQ+CMPLX(0.0,CHARG)
0120:      SUMCHG=SUMCHG+CHARG
0121:      SUMLOS=SUMLOS+FLOSS
0122:      IF(OPTION(11).EQ.0) GO TO 660
                                LPL
                                LPL
0123:      WRITE(IWRITE,6018) LINE(L),BUSNAM(I),NP(L),BUSNAM(J),NO(L),
0124:      X      FLOWP,FLOWQ,FLOSS,CHARG
                                LPL
0125:      IF(OPTION(13).NE.0) WRITE(IWRITE,6017)
0126:      660 CONTINUE
0127:      IF(OPTION(11).NE.0) WRITE(IWRITE,6016)
0128:      C
0129:      MISMAT=SUMGEN+CMPLX(0.0,(SUMSTC+SUMCHG))-SUMLOD-SUMLOS
0130:      IF(OPTION(12).EQ.0) RETURN
0131:      C
0132:      WRITE(IWRITE,6701)
                                LPL
0133:      WRITE(IWRITE,6702) SUMGEN
0134:      WRITE(IWRITE,6703) SUMLOD
0135:      WRITE(IWRITE,6704) SUMSTC
0136:      WRITE(IWRITE,6707) SUMCHG
0137:      WRITE(IWRITE,6705) SUMLOS
0138:      WRITE(IWRITE,6706) MISMAT
0139:      6701 FORMAT('1',40X,'SYSTEM TOTALS' /41X,'=====/' //51X,'MW
0140:      X MVAR')
0141:      6702 FORMAT('0',30X,'GENERATION', 5X,2F9.2)
0142:      6703 FORMAT('0',30X,'LOAD', 11X,2F9.2)
0143:      6704 FORMAT('0',30X,'STATIC CAPACITOR', 8X,F9.2)
0144:      6705 FORMAT('0',30X,'LOSSES', 9X,2F9.2)
0145:      6706 FORMAT('0',30X,'MISMATCH', 7X,2F9.2)
0146:      6707 FORMAT('0',30X,'LINE CHARGING', 11X,F9.2)
0147:      C
0148:      RETURN
0149:      END
                                LPL
```

PROGRAM SIZE: 0918 DATA POOL SIZE: 0996 ERROR COUNT: 0000

ภาคผนวก ข .

ตัวอย่างการวิเคราะห์โหลดโพลระบบของการไฟฟ้าฝ่ายผลิตฯ

หน้า 175	แสดงถึงแผนภูมิเส้นเดี่ยวในระบบแรงดัน 230 กิโลโวลต์ และ 69 กิโลโวลต์ บางส่วนของการไฟฟ้าฝ่ายผลิตฯ
หน้า 176	ข้อมูลของบัสในระบบของการไฟฟ้าฝ่ายผลิตฯ ที่นำมาวิเคราะห์โหลดโพล
หน้า 177-178	ข้อมูลของสายส่งไฟฟ้าและหม้อแปลงไฟฟ้า
หน้า 179-180	ผลลัพธ์ระหว่างการทำอิ เทอ เรทีฟ
หน้า 181	ผลลัพธ์ของแรงดันและกำลังผลิต
หน้า 182-183	ผลลัพธ์ของพลังไฟฟ้าไหลในสายส่งไฟฟ้าและในหม้อแปลงไฟฟ้า
หน้า 184	ผลสรุปของระบบ
หน้า 185	ผลลัพธ์จากการวิเคราะห์แบบแยกส่วนนำมา เขียนแผนภูมิแสดงการไหลของพลัง ไฟฟ้า
หน้า 186	ผลลัพธ์จากการวิเคราะห์แบบรวม เปรียบเทียบกับผลลัพธ์จากการวิเคราะห์แบบ แยกส่วน



04/28/80

BUS INPUT DATA

BUS NO.	ZONE	TYPE	VOLT	GENERATION		MVAR LIMIT		LOAD		SHUNT
				MW	MVAR	MAX	MIN	MW	MVAR	CAPACITOR
1	1	3	1.087	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1	2	1.087	154.00	0.00	200.00	-100.00	68.00	26.81	0.00
3	1	1	1.000	0.00	0.00	0.00	0.00	34.80	19.40	0.00
4	1	1	1.000	0.00	0.00	0.00	0.00	183.00	88.20	0.00
5	1	1	1.000	0.00	0.00	0.00	0.00	45.43	34.46	0.00
6	2	1	1.000	0.00	0.00	0.00	0.00	269.00	155.21	0.00
7	2	1	1.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	2	2	1.000	163.00	0.00	200.00	-100.00	331.00	260.00	60.00
9	2	1	1.000	0.00	0.00	0.00	0.00	156.00	92.00	64.80
10	2	1	1.000	0.00	0.00	0.00	0.00	180.00	77.71	0.00
11	2	2	1.000	1268.00	0.00	800.00	-500.00	320.50	200.72	60.00
12	2	1	1.000	0.00	0.00	0.00	0.00	94.00	58.80	32.40
13	2	1	1.000	0.00	0.00	0.00	0.00	66.10	25.09	0.00

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LINE LIST

LINE NO.	BUS P	BUS Q	IMPEDANCE		Y SHUNT	TRANSF. RATIO
			R	X		
1	1	3	0.0214	0.1623	0.3310	1.000
2	1	3	0.0214	0.1623	0.3310	1.000
3	1	3	0.0212	0.1646	0.3280	1.000
4	2	3	0.0399	0.1944	0.3750	1.000
5	2	3	0.0399	0.1944	0.3750	1.000
6	3	4	0.0129	0.0977	0.1960	1.000
7	3	4	0.0129	0.0977	0.1960	1.000
8	3	6	0.0281	0.1682	0.3410	1.000
9	3	5	0.0245	0.1875	0.3790	1.000
10	5	6	0.0081	0.0627	0.1260	1.000
11	4	10	0.0105	0.0796	0.1590	1.000
12	4	7	0.0095	0.0176	0.1430	1.000
13	7	9	0.0007	0.0052	0.0100	1.000
14	6	7	0.0018	0.0143	0.0270	1.000
15	7	8	0.0000	0.0199	0.0000	0.940
16	9	10	0.0010	0.0078	0.0160	1.000
17	10	12	0.0014	0.0113	0.0220	1.000

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18	10	12	0.0014	0.0113	0.0220	1.000
19	6	11	0.0023	0.0174	0.0340	1.000
20	6	11	0.0023	0.0174	0.0340	1.000
21	11	12	0.0017	0.0136	0.0170	1.000
22	11	12	0.0017	0.0136	0.0170	1.000
23	12	13	0.0093	0.0728	0.1436	1.000
24	12	13	0.0093	0.0728	0.1436	1.000

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10	179.1549	2.3084	0.027756
11	178.6098	2.2029	0.018909
12	178.2457	2.1652	0.012584
13	178.0241	2.1340	0.008497
14	177.8845	2.1021	0.005892
15	177.7879	2.0759	0.004156
16	177.7183	2.0572	0.002934
17	177.6589	2.0447	0.002063
18	177.6334	2.0362	0.001439
19	177.6090	2.0302	0.001003
20	177.5914	2.0263	0.000702

SUCCESSFUL SOLUTION REACHED

04/28/80

OUTPUT BUS VOLTAGE AND GENERATION

BUS IDENTIFICATION				BUS VOLTAGE			GENERATION		LOAD		STATICS
NAME	NO.	ZONE	TYPE	PU	KV	DEG	MW	MVAR	MW	MVAR	MVAR
BB-230	1	1	3	1.0870	250.00	0.00	177.59	2.03	0.00	0.00	0.00
SK-230	2	1	2	1.0369	250.00	-0.72	154.00	10.60	58.00	26.81	0.00
NS-230	3	1	1	1.0485	241.15	-4.64	0.00	0.00	34.80	19.40	0.00
AT-230	4	1	1	0.9773	224.79	-8.55	0.00	0.00	183.00	88.20	0.00
BP2-230	5	1	1	0.9901	227.72	-7.45	0.00	0.00	45.43	34.46	0.00
BN-230	6	2	1	0.9810	225.62	-6.82	0.00	0.00	269.00	155.21	0.00
NB-230	7	2	1	0.9676	222.55	-8.32	0.00	0.00	0.00	0.00	0.00
NB-69	8	2	2	1.0000	69.00	-10.18	163.00	55.27	331.00	260.00	60.00
LPR-230	9	2	1	0.9689	222.86	-8.37	0.00	0.00	156.00	92.00	64.80
BK-230	10	2	1	0.9750	224.25	-7.72	0.00	0.00	180.00	77.71	0.00
SB-230	11	2	2	1.0000	230.00	-4.69	1268.00	474.13	320.50	200.72	60.00
BPL-230	12	2	1	0.9846	226.45	-6.61	0.00	0.00	94.00	58.80	32.40
AP-230	13	2	1	0.9769	224.70	-8.01	0.00	0.00	65.10	25.09	0.00

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LINE FLOWS

LINE NO.	FROM BUS P		TO BUS O		FLOW FROM BUS P		FLOW TO BUS O		LOSSES		CHARGING
	NAME	NO.	NAME	NO.	MW	MVAR	MW	MVAR	MW	MVAR	MVAR
1	BB-230	1	NS-230	3	59.49	0.65	-58.78	-32.98	0.72	5.42	37.75
2	PB-230	1	NS-230	3	59.49	0.65	-58.78	-32.98	0.72	5.42	37.75
3	BB-230	1	NS-230	3	58.63	0.73	-57.94	-32.79	0.69	5.35	37.41
4	SK-230	2	NS-230	3	43.00	-8.11	-42.31	-31.29	0.69	3.37	42.77
5	SK-230	2	NS-230	3	43.00	-8.11	-42.31	-31.29	0.69	3.37	42.77
6	NS-230	3	AT-230	4	82.44	57.30	-81.10	-67.27	1.34	10.16	20.13
7	NS-230	3	AT-230	4	82.44	57.30	-81.10	-67.27	1.34	10.16	20.13
8	NS-230	3	BN-230	6	29.49	18.88	-28.91	-50.54	0.58	3.50	35.15
9	NS-230	3	BP2-230	5	30.92	8.45	-30.52	-44.77	0.40	3.09	39.41
10	BP2-230	5	BN-230	6	-14.91	10.30	14.95	-22.22	0.04	0.32	12.24
11	AT-230	4	BK-230	10	-18.87	-2.08	18.91	-12.75	0.04	0.32	15.15
12	AT-230	4	NB-230	7	-1.95	48.40	2.26	-61.36	0.30	0.56	13.52
13	NB-230	7	LPR-230	9	12.11	-27.04	-12.10	26.15	0.01	0.05	0.94
14	BN-230	6	NB-230	7	182.90	59.54	-182.18	-66.38	0.72	5.72	2.56
15	NB-230	7	NR-69	8	157.94	154.81	-167.94	-145.02	-0.00	9.80	0.00
16	LPR-230	9	BK-230	10	-144.39	-56.75	144.65	57.23	0.26	1.99	1.51
17	BK-230	10	BPL-230	12	-171.52	-61.20	172.11	63.02	0.49	3.93	2.11

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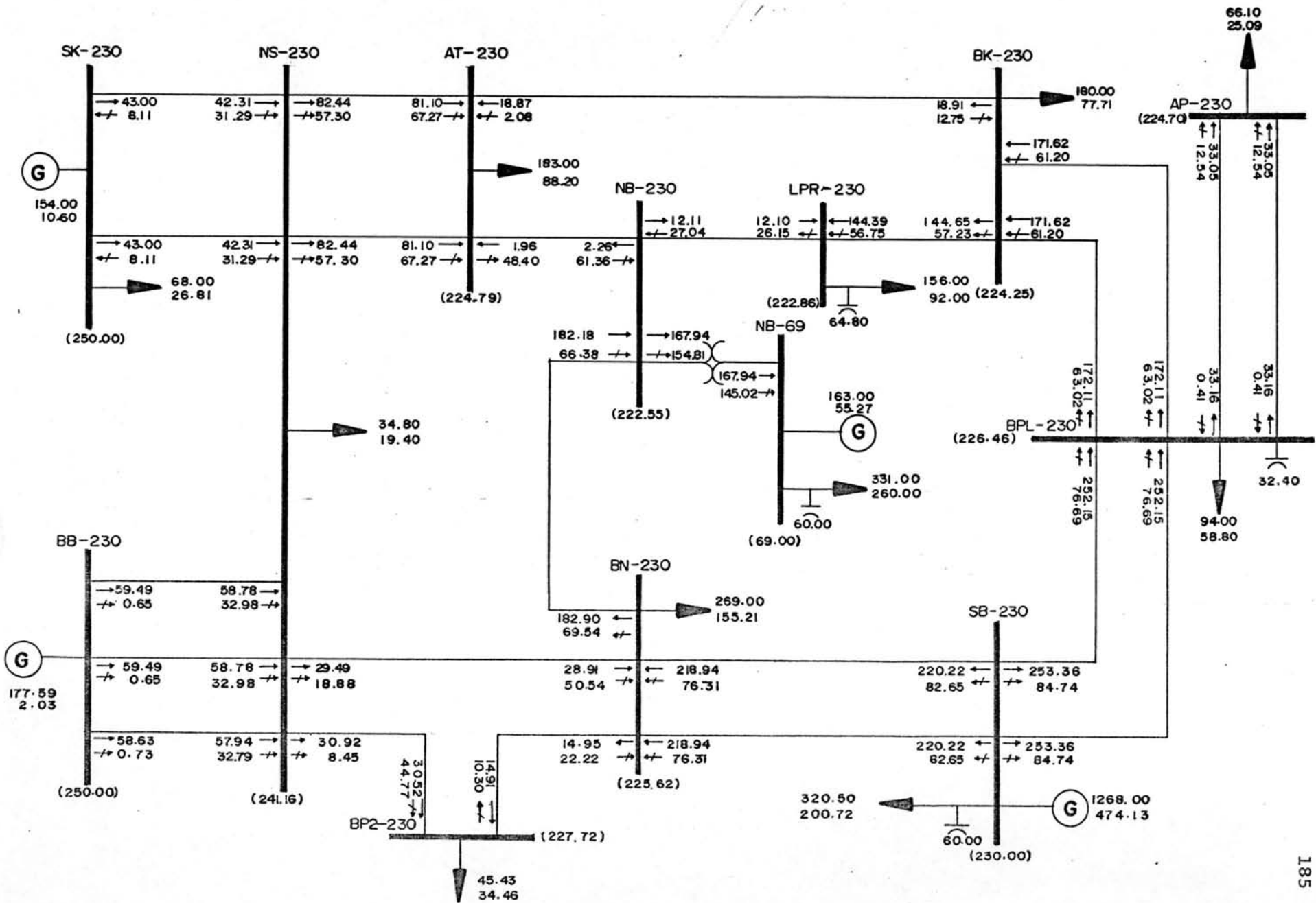
18	BK-230	10	BPL-230	12	-171.62	-61.20	172.11	63.02	0.49	3.93	2.11
19	BN-230	6	SB-230	11	-218.94	-76.31	220.22	82.65	1.28	9.68	3.34
20	BN-230	6	SB-230	11	-218.94	-76.31	220.22	82.65	1.28	9.68	3.34
21	SB-230	11	BPL-230	12	253.36	84.74	-252.15	-76.69	1.22	9.73	1.67
22	SB-230	11	BPL-230	12	253.36	84.74	-252.15	-76.69	1.22	9.73	1.67
23	BPL-230	12	AP-230	13	33.16	-0.41	-33.05	-12.54	0.11	0.86	13.81
24	BPL-230	12	AP-230	13	33.16	-0.41	-33.05	-12.54	0.11	0.86	13.81

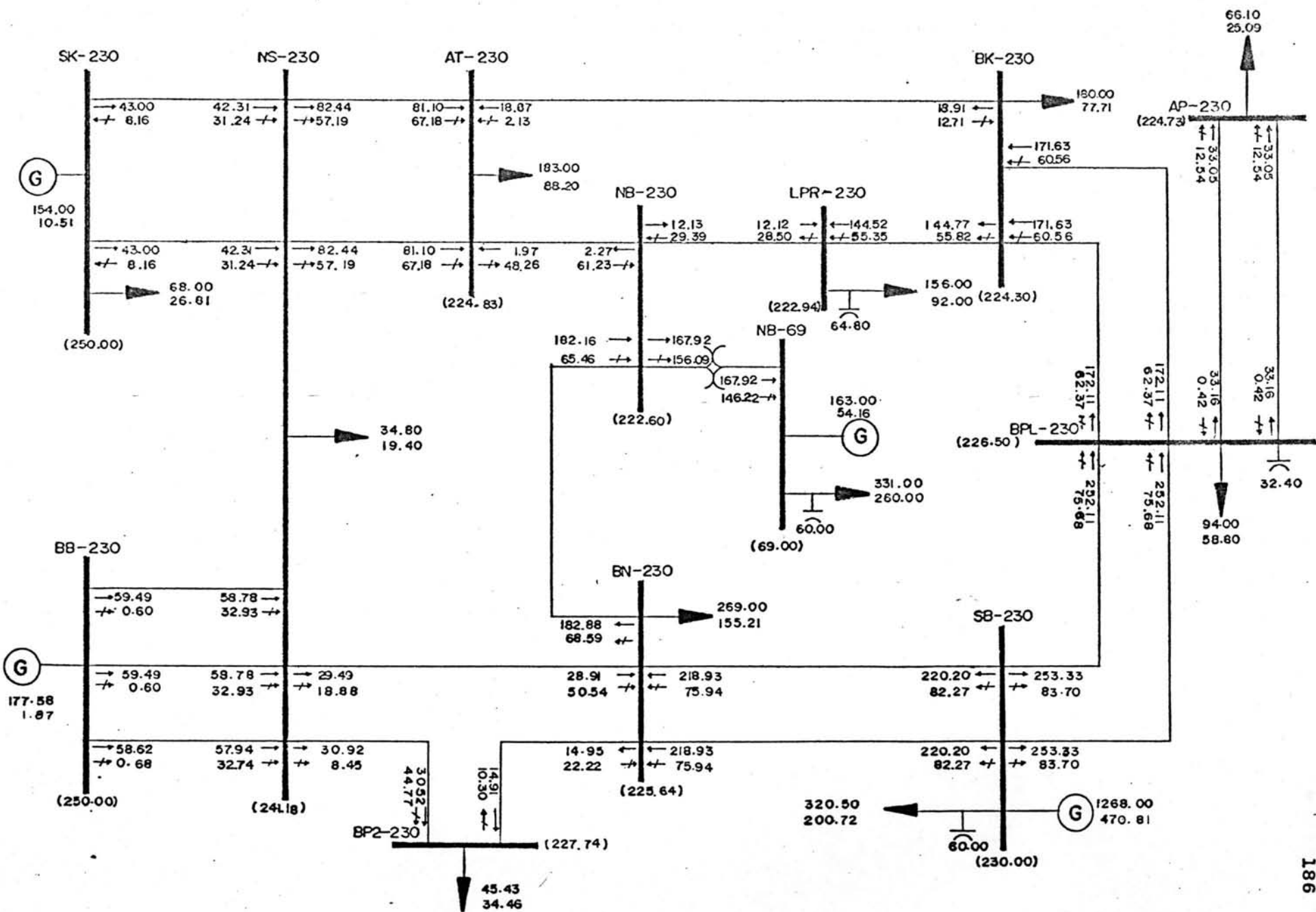
04/28/80

SYSTEM TOTALS

=====

	MW	MVAR
GENERATION	1762.59	542.03
LOAD	1747.83	1038.40
STATIC CAPACITOR		217.20
LINE CHARGING		401.06
LOSSES	14.72	116.97
MISMATCH	0.04	4.91





ประวัติผู้เขียน

นายวุฒินันท์ สุรพลชัย เกิดเมื่อวันที่ 3 กุมภาพันธ์ พ.ศ. 2494 ณ จังหวัดสุพรรณบุรี สำเร็จการศึกษาระดับมัธยมศึกษาจากคณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เมื่อปี พ.ศ. 2517 หลังจากสำเร็จการศึกษาแล้วได้เข้าทำงานที่การไฟฟ้าฝ่ายผลิตฯ ฝ่ายควบคุมระบบกำลังไฟฟ้า ทำหน้าที่วิเคราะห์การผลิตและจ่ายกระแสไฟฟ้าประมาณ 6 เดือน หลังจากนั้นได้ปฏิบัติงานเป็นวิศวกรประจำกะ ประจำศูนย์ควบคุมระบบกำลังไฟฟ้าส่วนกลาง เป็นเวลาประมาณ 5 ปี ปัจจุบันดำรงตำแหน่งวิศวกรอันดับ 2 ทำหน้าที่วิศวกรผู้ดูแลอุปกรณ์และเครื่องคอมพิวเตอร์ของศูนย์ควบคุมระบบกำลังไฟฟ้า แผนกอุปกรณ์ศูนย์ควบคุมระบบกำลังไฟฟ้า กองควบคุมระบบกำลังไฟฟ้าส่วนกลาง ฝ่ายควบคุมระบบกำลังไฟฟ้า การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย



แก้คำผิด

1. คำว่า "เมตริก" แก้เป็น "เมตริกซ์" ทุกคำ
2. คำว่า "โพลซาร์จ" แก้เป็น "โพลซาร์ท" ทุกคำ