



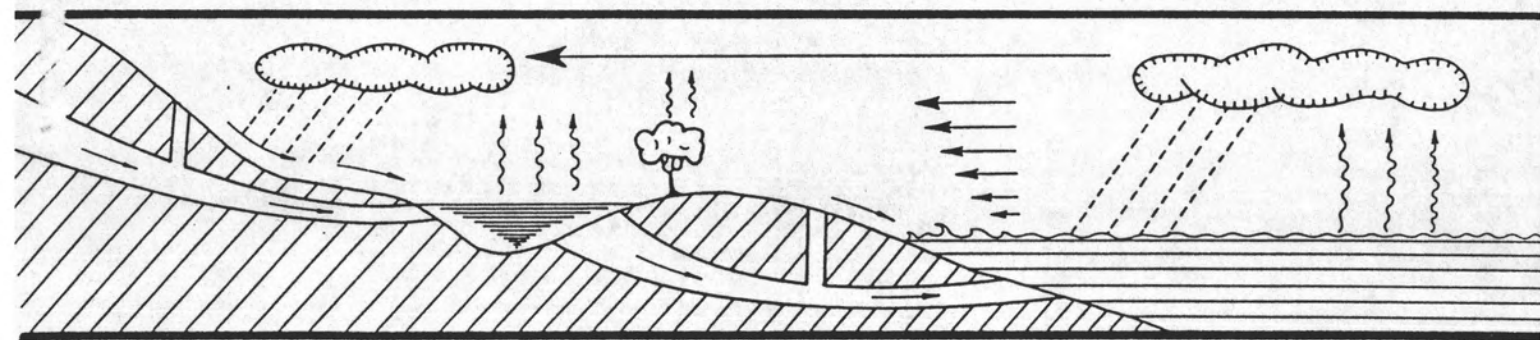
เอกสารอ้างอิง

1. ชำรง เปรมปรีดิ์, อุทกวิทยาประยุกต์, สาขาวิศวกรรมแหล่งน้ำ ภาควิชาวิศวกรรมโยธา จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพฯ, 2524.
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TANK MODEL VERSION 2.C



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C      TANK MODEL VERSION 2C (4 X 4)
C      SUPOT PROMNARET * MARCH 1984
C
C      DEFINE FILE 2 (200,740,U,ID2)
C      DEFINE FILE 3 (100,740,U,ID3)
C      DEFINE FILE 4 (50,600,U,ID4)
C      DEFINE FILE 7 (20,740,U,ID7)
C      DEFINE FILE 8 (1600,40,U,ID8)
C      DEFINE FILE 9 (30,8,U,ID9)
C
C      COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAF
1,      ANAME(20),FNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2,      D8,ID8
C      INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,D8,SAVEX
C      COMMON /PRM/ S1,S2,HA1,HA2,A0,A1,A2,HB1,B0,B1,HC1,C0,C1
1,      HD1,D0,D1,LAG,E(12),CE(12),K1,K2,CP(10),WE(10),CM(12)
C      REAL K1,K2
C      COMMON /HS/ HS
C      COMMON /CPM/ CPM(12)
C      COMMON /AR/ AR(4)
C      COMMON /ID/ XE,E1,E2,XEI
C      DIMENSION XE(10)
C      COMMON /X/ XA(4,10),XS(4,10),XB(4,10),XC(4,10),XD(4,10)
C      COMMON /XIN/ XAIN(4,10),XSIN(4,10),XBIN(4,10),XCIN(4,10)
1,      XDIN(4,10)
C      COMMON /HYGR/ NPLOT,NSCAL,LY,YMIN,YMAX,SCAL(5),GRFMT(10)
C      COMMON /FB/ IRQFB(5),IRDFB(4)
C      COMMON /IN/ MQ,MQF,ME,MEF,MP,MPF,MH,MHF,MC,MCF,AREA,Q0
C      DIMENSION XAI(4,10),XBI(4,10),XCI(4,10),XDI(4,10),XSI(4,10)
1,      YA(4,10),YB(4,10),YC(4,10),YD(4,10)
C      CHARACTER*4 AA,ARQ(5),ARD(4)
C      DIMENSION CR(50)
C      DIMENSION CR(50),AM(12),MONTH(12),FMTR(6),CD(10)
C      INTEGER SMONTH,SDAY,EMONTH,EDAY
C      DIMENSION CIMAG(20)
C      DATA HY/ 'H'/
C      DATA DC,HY/'D','H'/
C      DATA MONTH/31,28,31,30,31,30,31,31,30,31,30,31/
C      DATA AM/'JAN','FEB','MAR','APR','MAY','JUN'
C      1, 'JUL','AUG','SEP','OCT','NOV','DEC'/
C      DATA MASK/0/,Q0/0./
C
C      SPECIFYING DATA SET REFERENCE NUMBER
C      D2 -- D8 : DISC (USUALLY)
C
C      D2=2
C      D3=3
C      D4=4
C      D7=7
C      D8=8
C      MT=9
C
C      READING INPUT FROM DATA SET NO 5
C
C      READ (5,14) ANAME
C      WRITE (6,40) ANAME
C      WRITE (6,13) ANAME
C      READ (5,1) CIMAG,INQPT,MQ,MQF,ME,MEF,MP,MPF,MH,MHF,MC,MCF
C      WRITE (6,13) CIMAG
C      READ (5,11) CIMAG,AREA
C      WRITE (6,13) CIMAG
C      READ (5,1) CIMAG,FYEAR,FMONTH

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WRITE (6,13) CIMAG
READ (5,1) CIMAG,LYEAR,LMONTH
WRITE (6,13) CIMAG
READ (5,1) CIMAG,NP
WRITE (6,13) CIMAG
ISNOW = 0
READ (5,1) CIMAG,IEVAF
WRITE (6,13) CIMAG
READ (5,11) CIMAG,Q0
WRITE (6,13) CIMAG
READ (5,12) CIMAG,DH
WRITE (6,13) CIMAG
READ (5,1) CIMAG,NITR
WRITE (6,13) CIMAG
READ (5,2) CIMAG,LAG,TLAG
WRITE (6,13) CIMAG
READ (5,11) CIMAG,CC
WRITE (6,13) CIMAG
READ (5,11) CIMAG,(WE(K),K=1,NP)
WRITE (6,13) CIMAG
READ (5,1) CIMAG,INVL
WRITE (6,13) CIMAG
DO 120 K=1,NP
DO 110 L=1,4
READ (5,11) CIMAG,XAI(L,K),XBI(L,K),XCI(L,K),XDI(L,K),XSI(L,K)
WRITE (6,13) CIMAG
IF (INVL .EQ. 0) READ (5,11) CIMAG,YA(L,K),YB(L,K),YC(L,K),YD(L,K)
IF (INVL .EQ. 0) WRITE (6,13) CIMAG
110 CONTINUE
120 CONTINUE

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READING VARIOUS TANK MODEL PARAMETERS
S1, S2 : MAXIMUM STORAGE OF PRIMARY AND
SECONDARY SOIL MOISTURES (8X,2F6.0)
K1, K2 : TRANSFER COEFFICIENTS FROM LOWER
TANK TO PRIMARY SOIL MOISTURE AND FROM
PRIMARY TO SECONDARY SOIL MOISTURE
(8X,2F6.0)
HA1 : FIRST SIDE OUTLET HEIGHT OF TOP TANK
HA2 : 2ND OUTLET HEIGHT OF TOP TANK
A0 : INFILTRATION COEFFICIENT OF TOP TANK
A1 : DISCHARGE COEFFICIENT FOR HA1
A2 : DISCHARGE COEFFICIENT FOR HA2
AND SO ON
E(M) : DAILY EVAPOTRANSPIRATION FOR
M-TH MONTH
CE(M) : RATE OF EVAPO(TRANSP)RATION VALUE
IN M-TH MONTH (8X,12F6.0)
CPM(M) : INCREASING COEFFICIENT OF
PRECIPITATION FOR M-TH MONTH
(8X,12F6.0)

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READ (5,11) CIMAG,(AR(L),L=1,4)
WRITE (6,13) CIMAG
READ (5,11) CIMAG,S1,S2
WRITE (6,13) CIMAG
READ (5,11) CIMAG,K1,K2
WRITE (6,13) CIMAG
READ (5,11) CIMAG,HA1,HA2,A0,A1,A2,HS
WRITE (6,13) CIMAG
READ (5,11) CIMAG,HB1,B0,B1
WRITE (6,13) CIMAG

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READ (5,11) CIMAG,HC1,C0,C1
WRITE (6,13) CIMAG
READ (5,11) CIMAG,HD1,D0,D1
WRITE (6,13) CIMAG
IF (IEVAP .EQ. 0) READ (5,11) CIMAG,(E(M),M=1,12)
IF (IEVAP .EQ. 0) WRITE (6,13) CIMAG
READ (5,11) CIMAG,(CE(M),M=1,12)
WRITE (6,13) CIMAG
READ (5,11) CIMAG,(CFM(M),M=1,12)
WRITE (6,13) CIMAG
READ (5,11) CIMAG,E1,E2,XEI
WRITE (6,13) CIMAG

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READING PARAMETERS FOR GRAPH PLOTTING
NPLOT : NUMBER OF CHARACTER PLOTTED
NSCAL : NUMBER OF SCALE POINT
LY : MAXIMUM PLOTTING POSITION
YMIN : MINIMUM VALUE TO BE PLOTTED
YMAX : MAXIMUM VALUE TO BE PLOTTED
SCAL(NX) : PLOTTING VALUE FOR NX-TH SCALE
           POINT
GRFMT : FORMAT SPECIFICATION FOR PLOTTING

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140 READ (5,3) CIMAG,NPLOT,NSCAL,LY,YMIN,YMAX
WRITE (6,13) CIMAG
READ (5,11) CIMAG,(SCAL(NX),NX=1,NSCAL)
WRITE (6,13) CIMAG
READ (5,15) CIMAG,GRFMT
WRITE (6,13) CIMAG

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C

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1 FORMAT (20A4,T9,12I6)
2 FORMAT (20A4,T9,I6,11G6.0)
3 FORMAT (20A4,T9,3I6,9G6.0)
11 FORMAT (20A4,T9,12G6.0)
12 FORMAT (20A4,T14,A1)
13 FORMAT (1X,20A4)
14 FORMAT (20A4,T1,20A4)
15 FORMAT (20A4,T11,10A4)
40 FORMAT('ROYAL IRRIGATION DEPARTMENT, THAILAND'
1,T118,'COMPUTER CENTER',/
2,1X,20A4,T118,'TANK MODEL V-2C',/)

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C

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IF (MP .GT. 0) GO TO 290
IF (INQPT .GT. 0) GO TO 290
DO 280 K=1,NP
280 READ (MT,K) (PNAME(J,K),J=1,4)
290 IF (INQPT .EQ. 1) CALL SSSSS
IF (INQPT .EQ. 2) CALL YYYYYY

```

C
C
C

NORMALIZING THE WEIGHT FOR DISCHARGE

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SWE=0.
DO 210 K=1,NP
210 SWE=SWE+WE(K)
DO 220 K=1,NP
220 WE(K)=WE(K)/SWE
SAR = 0.
DO 230 L=1,4
230 SAR = SAR + AR(L)
DO 240 L=1,4
240 AR(L) = AR(L)/SAR

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C

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C                                     READING 'MASK' AND/OR 'FEED'
C
300 READ (5,15,END=400) CIMAG,AA
    WRITE (6,13) CIMAG
C
    IF (AA .EQ. 'MASK') GO TO 320
    IF (AA .EQ. 'FEED') GO TO 330
C
C                                     READING VARIOUS DATA FOR MASK :
C                                     MASK, YEAR, SMONTH, SDAY, EMONTH, EDAY
C
320 READ (5,11) CIMAG,MASK
    WRITE (6,13) CIMAG
    IF (MASK .EQ. 0) GO TO 300
    DO 321 M=1,MASK
    READ (5,11) CIMAG, YEAR, SMONTH, SDAY, EMONTH, EDAY
    WRITE (6,13) CIMAG
    CALL QMASK(YEAR, SMONTH, SDAY, EMONTH, EDAY)
321 CONTINUE
    GO TO 300
C
C                                     READING VARIOUS DATA FOR FEEDBACK DISREGARDING:
C                                     IRQFB, IRDFB
C
330 READ (5,11) CIMAG, (IRQFB(I), I=1,5), (IRDFB(I), I=1,4)
    WRITE (6,13) CIMAG
    DO 331 I=1,5
    ARQ(I)='
    IF (IRQFB(I) .EQ. 1) ARQ(I)=' 1'
331 CONTINUE
    DO 332 I=2,4
    ARD(I)='
    IF (IRDFB(I) .EQ. 1) ARD(I)=' 1'
332 CONTINUE
    GO TO 300
C
400 CONTINUE
C
C                                     GETTING NUMBER OF YEAR
C
NYEAR=LYEAR-FYEAR
IF (LMONTH .GT. FMONTH) NYEAR=NYEAR+1
C
C                                     WRITING NAME OF BASIN
C
WRITE(6,40) ANAME
C
C                                     START OF CALIBRATION (NITR = NUMBER OF REPEAT)
C
DO 480 ITR=1,NITR
C
IF (INVL .NE. 0) GO TO 411
C
C                                     SETTING INITIAL STORAGE
C
DO 410 K=1,NP
DO 410 L=1,4
IF (YA(L,K) .NE. 0.) XAI(L,K)=(YA(L,K)/A1)+S1+HA1
IF (YB(L,K) .NE. 0.) XBI(L,K)=(YB(L,K)/B1)+HB1
IF (YC(L,K) .NE. 0.) XCI(L,K)=(YC(L,K)/C1)+HC1
IF (YD(L,K) .NE. 0.) XDI(L,K)=(YD(L,K)/D1)+HD1
410 CONTINUE

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411 DO 420 K=1,NP
      DO 420 L=1,4
      XA(L,K) = XAI(L,K)
      XB(L,K) = XBI(L,K)
      XC(L,K) = XCI(L,K)
      XD(L,K) = XDI(L,K)
      XS(L,K) = XSI(L,K)
420 CONTINUE
C
      IF (INVL .EQ. 0) GO TO 450
C
C
C
C
      IDISK=0
      SAVEX=0
      DO 440 NR=1,3
      CALL TNK4X4(IDISK,SAVEX)
      CALL INVAL3(NR,4*NP,XA,XS,XB,XC,XD)
440 CONTINUE
450 CONTINUE
C
C
C
      RESETTING INITIAL STORAGES FOR REPETITION
C
      DO 470 K=1,NP
      DO 470 L=1,4
      XAIN(L,K) = XA(L,K)
      XBIN(L,K) = XB(L,K)
      XCIN(L,K) = XC(L,K)
      XDIN(L,K) = XD(L,K)
      XSIN(L,K) = XS(L,K)
470 CONTINUE
C
C
      TANK MODEL CALCULATION
C
      IDISK=1
      SAVEX=0
      CALL TNK4X4 (IDISK,SAVEX)
C
C
C
      BRANCH ACCORDING TO 'DH' ('H' OR 'D')
C
      IF (DH .EQ. HY) GO TO 475
      DURATION CURVE COMPARISON METHOD
C
C
C
      CALCULATED DISCHARGES ARE SHIFTED USING
      TIME LAG (LAG)
C
      CALL QELAG (LAG)
C
C
C
      CALCULATION OF CRITERIA (RQ, RD) FOR PARAMETER
      ADJUSTMENT AND CALCULATION OF CRITERIA (CR)
      FOR MATCHING
C
      CALL DCCR (ITR,CR(ITR),CC,LAG,Q0)
      GO TO 476
C
C
C
      HYDROGRAPH METHOD
C
      IN FIRST TIME, OBSERVED DISCHARGE IS MODIFIED
      BY TIME LAG (TLAG)
C
475 CONTINUE

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IF (ITR .EQ. 1) CALL QLAG (TLAG)
C
C           CLASIFYING SUBPERIODS USING ESTIMATED DISCHARGE
C
CALL CLSFY (CC,Q0)
C
C           CALCULATION OF RQ, RD FOR EACH SUBPERIOD AND CR
C
CALL RQRDCR (CR(ITR),Q0)
C
C           WRITING PAGE HEADING
C
476 CONTINUE
NEW=64/(11+NP*2)
IF (ITR .GT. NEW .AND. MOD(ITR,NEW) .EQ. 1) WRITE (6,40) ANAME
C
C           WRITING RQ, RD AND CR
C
IDISK=1
CALL PRDHCR (ITR,CR(ITR),DH,IDISK)
C
C           IN LAST TIME, PARAMETER ADJUSTING IS SKIPPED
C
IF (ITR .EQ. NITR) GO TO 490
C
C           PARAMETER ADJUSTING
C
CALL ADJUST (IERR,A0,A1,A2,B0,B1,C0,C1)
IF (IERR .NE. 0) GO TO 490
480 CONTINUE
C
C           GETTING RESULT IN WHICH CR IS MINIMUM
C
490 MIN=1
DO 500 MM=1,ITR
IF (CR(MM) .GE. CR(MIN)) GO TO 500
MIN=MM
500 CONTINUE
C
C           WRITING RESULT IN WHICH CR IS MINIMUM
C
CALL GOAL (MIN,DH,Q0)
C
STOP
END
BLOCK DATA
COMMON /FB/ IRQFB(5),IRDFB(4)
COMMON /ORD/ NY,Y(50)
DATA (Y(N),N=1,11) /4.,2.,1.,0.8,0.6,0.4,0.2,0.09,0.07,0.05,0./
1, NY /11/
DATA IRQFB,IRDFB /9*0/
END
C
C           INPUT HYDROMET DATA (STATIONS) IN A YEAR SEQUENCE
C
C
SUBROUTINE SSSSS
C
C           DEFINE FILE 2(200,370,U,ID2)
C
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
1, ANAME(20),FNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7

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2,          DB, IDB
INTEGER FYEAR, FMONTH, YEAR, D2, D3, D4, D7, D8
COMMON /Y/ Q(370), P(370), E(370), T(370), DUM1(370), DUM(380,6)
COMMON /IN/ MQ, MQF, ME, MEF, MP, MPF, MH, MHF, MC, MCF, AREA, QO
DIMENSION MONTH(12), INDEX(13)
DATA MONTH/          30,31,30,31,31,30,31,30,31,31,28,31/
C DATA MONTH/31,28,31,30,31,30,31,31,30,31,30,31/
C DATA INDEX/1,31,62,92,123,154,184,215,245,276,307,335,366/
C DATA INDEX/1,32,60,91,121,152,182,213,244,274,305,335,366/
C
LYEAR = LLYEAR
IF (MQ .GT. 0) READ (MQ,30) QNAME
IF (MP .EQ. 0) GO TO 150
DO 100 K=1, NP
READ (MP,30) (PNAME(J,K), J=1,4)
100 WRITE (MT' K) (PNAME(J,K), J=1,4)
30 FORMAT (20A4)
C
C          SETTING NUMBER OF YEAR AND INITIAL VALUES OF
C          RELATIVE POSITION FOR DATA SET D2
C
150 NYEAR=LYEAR-FYEAR
IF (FMONTH .LT. LMONTH) NYEAR=NYEAR+1
LYEAR = LLYEAR - 1
IRQ=1
IRY=NYEAR+1
KR=1+2*ISNOW
NYR=NP+NP*2*ISNOW
C
C          CALCULATING COEFFICIENT TO CONVERT FROM
C          M**3/SEC TO MILLIMETER
C
AR=86.4/AREA
C
C          BEGINNING OF YEAR LOOP
C
DO 500 YEAR=FYEAR,LYEAR
C
Q(366)=0.
E(366)=0.
P(366)=0.
T(366)=0.
C
MONTH(11)=28
IF (MOD(YEAR+1,4).EQ.0) MONTH(11)=29
C MONTH(2)=28
C IF (MOD(YEAR,4).EQ.0) MONTH(2)=29
IADD=0
IF(MOD(YEAR+1,4).EQ.0) IADD=1
C IF(MOD(YEAR,4).EQ.0) IADD=1
C
C          READING OBSERVED DISCHARGE FOR ONE YEAR
C
IF (MQ .EQ. 0) GO TO 220
IF (MQF .LE. 0 .OR. MQF .GT. 4) GO TO 220
IF (MQF .EQ. 1) CALL CARDI(MONTH, MQ, Q)
IF (MQF .EQ. 2) CALL TAPEI(MONTH, MQ, Q)
IF (MQF .EQ. 3) CALL CAD6D(INDEX, IADD, MQ, Q)
IF (MQF .EQ. 4) CALL CAD4D(INDEX, IADD, MQ, Q)
C
DO 210 I=1,366
IF (Q(I) .EQ. -999.) GO TO 210

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C
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C
      CONVERTING FROM M**3/SEC TO MILLIMETER, AND SET
      TO -999., IF OBSERVED DISCHARGE PLUS Q0 IS LESS
      THAN OR EQUAL TO ZERO
C
      Q(I)=Q(I)*AR
      IF (Q(I)+Q0 .LE. 0.) Q(I)=-999.
210 CONTINUE
C
C
C
C
      WRITING OBSERVED DISCHARGE (ONE YEAR) TO DATA
      SET D2, AND ADDING 1 TO RELATIVE POSITION IN D2
C
      WRITE (D2'IRQ) (Q(I),I=1,366)
      IRQ=IRQ+1
C
220 IF (IEVAP .NE. 1) GO TO 250
C
C
C
C
      IF IEVAP=1, EVAPO(TRANSPI)RATION DATA FOR ONE
      YEAR ARE READ, AND ARE WRITTEN INTO DATA SET D2
C
      IF (ME .EQ. 0) GO TO 250
      IF (MEF .EQ. 0 .OR. MEF .GT. 4) GO TO 250
      IF (MEF .EQ. 1) CALL CARDI(MONTH,ME,E)
      IF (MEF .EQ. 2) CALL TAPEI(MONTH,ME,E)
      IF (MEF .EQ. 3) CALL CAD6D(INDEX,IADD,ME,E)
      IF (MEF .EQ. 4) CALL CAD4D(INDEX,IADD,ME,E)
      WRITE (D2'IRY) (E(I),I=1,366)
      IRY=IRY+1
C
C
C
C
      READING OBSERVED PRECIPITATION FOR ONE YEAR AND
      WRITING INTO DATA SET D2
C
250 IF (MP .EQ. 0) GO TO 320
      IF (MPF .EQ. 0 .OR. MPF .GT. 4) GO TO 320
      IRP=IRY
      DO 310 K=1,NP
      IF (MPF .EQ. 1) CALL CARDI(MONTH,MP,P)
      IF (MPF .EQ. 2) CALL TAPEI(MONTH,MP,P)
      IF (MPF .EQ. 3) CALL CAD6D(INDEX,IADD,MP,P)
      IF (MPF .EQ. 4) CALL CAD4D(INDEX,IADD,MP,P)
C
      WRITE (D2'IRP) (P(I),I=1,366)
      IRP=IRP+KR
310 CONTINUE
C
320 IF (ISNOW.EQ.0) GO TO 500
C
C
C
C
      IF ISNOW=1, TMAX AND TMIN FOR ONE YEAR ARE
      READ, AND ARE WRITTEN INTO DATA SET D2
C
      IRT=IRY+1
      DO 420 K=1,NP
C
      DO 410 J=1,2
C
      IF (J .EQ. 1) MD=MH
      IF (J .EQ. 2) MD=MC
      IF (J .EQ. 1) MDF=MHF
      IF (J .EQ. 2) MDF=MCF
      IF (MD .EQ. 0) GO TO 410
      IF (MDF .LE. 0 .OR. MDF .GT. 4) GO TO 410
C

```

```

IF (MDF .EQ. 1) CALL CARDI(MONTH,MD,T)
IF (MDF .EQ. 2) CALL TAPEI(MONTH,MD,T)
IF (MDF .EQ. 3) CALL CAD6D(INDEX,IADD,MD,T)
IF (MDF .EQ. 4) CALL CAD4D(INDEX,IADD,MD,T)
C
IR=IRT+J-1
WRITE (DZ'IR) (T(I),I=1,366)
410 CONTINUE
IRT=IRT+KR
C
420 CONTINUE
C
500 IRY=IRY+NYR
C
RETURN
END
C
C INPUT HYDROMET DATA (YEARS) IN A STATION SEQUENCE
C
SUBROUTINE YYYYY
C
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
COMMON // FYEAR,FMONTH,LLYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
1, ANAME(20),PNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2, D8,ID8
INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,D8
COMMON /Y/ Q(370),P(370),E(370),T(370),DUM1(370),DUM(380,6)
COMMON /IN/ MQ,MQF,ME,MEF,MP,MPF,MH,MHF,MC,MCF,AREA,QO
DIMENSION MONTH(12),INDEX(13)
DATA MONTH/ 30,31,30,31,31,30,31,30,31,31,28,31/
DATA INDEX/1,31,62,92,123,154,184,215,245,276,307,335,366/
C
C SETTING NUMBER OF YEAR AND INITIAL VALUES OF
C RELATIVE POSITION FOR DATA SET D2
C
LYEAR = LLYEAR
NYEAR=LYEAR-FYEAR
IF (FMONTH .LT. LMONTH) NYEAR=NYEAR+1
LYEAR = LLYEAR - 1
IRQ=1
KR=1+2*ISNOW
C
C CALCULATING COEFFICIENT TO CONVERT FROM
C M**3/SEC TO MILLIMETER
C
AR=86.4/AREA
C
C READING OBSERVED DISCHARGE AND WRITING TO DATA
C SET D2
C
IF (MQ .EQ. 0) GO TO 220
IF (MQF .LE. 0 .OR. MQF .GT. 4)GO TO 220
C
READ (MQ,30) QNAME
30 FORMAT (20A4)
C
DO 215 YEAR=FYEAR,LYEAR
C
MONTH(11)=28
IF (MOD(YEAR+1,4).EQ.0) MONTH(11)=29
IADD=0
IF(MOD(YEAR+1,4).EQ.0) IADD=1

```




```

C
Q(366)=0.
IF (MQF .EQ. 1) CALL CARDI(MONTH,MQ,Q)
IF (MQF .EQ. 2) CALL TAPEI(MONTH,MQ,Q)
IF (MQF .EQ. 3) CALL CAD6D(INDEX,IADD,MQ,Q)
IF (MQF .EQ. 4) CALL CAD4D(INDEX,IADD,MQ,Q)
C
DO 210 I=1,366
IF (Q(I) .EQ. -999.) GO TO 210
C
C           CONVERTING FROM M**3/SEC TO MILLIMETER, AND SET
C           TO -999., IF OBSERVED DISCHARGE PLUS Q0 IS LESS
C           THAN OR EQUAL TO ZERO
C
Q(I)=Q(I)*AR
IF (Q(I)+Q0 .LE. 0.) Q(I)=-999.
210 CONTINUE
C
WRITE (D2'IRQ) (Q(I),I=1,366)
IRQ=IRQ+1
C
215 CONTINUE
C
READ (MQ,30)
C
C
220 IF (IEVAP .NE. 1) GO TO 250
C
C           IF IEVAF=1, EVAFO(TRANSPI)RATION DATA ARE READ,
C           AND ARE WRITTEN INTO DATA SET D2
C
IF (ME .EQ. 0) GO TO 250
IF (MEF .EQ. 0 .OR. MEF .GT. 4) GO TO 250
READ (ME,30)
IYEAR=0
DO 230 YEAR=FYEAR,LYEAR
MONTH(11)=28
IF (MOD(YEAR+1,4) .EQ. 0) MONTH(11)=29
IADD=0
IF(MOD(YEAR+1,4) .EQ. 0) IADD=1
E(366)=0.
IYEAR=IYEAR+1
IF (MEF .EQ. 1) CALL CARDI(MONTH,ME,E)
IF (MEF .EQ. 2) CALL TAPEI(MONTH,ME,E)
IF (MEF .EQ. 3) CALL CAD6D(INDEX,IADD,ME,E)
IF (MEF .EQ. 4) CALL CAD4D(INDEX,IADD,ME,E)
IRE = NYEAR + (IYEAR-1)*(NP+1)*KR + 1
WRITE (D2'IRE) (E(I),I=1,366)
230 CONTINUE
READ (ME,30)
C
250 IF (MP .EQ. 0) GO TO 320
IF (MPF .LE. 0 .OR. MPF .GT. 4) GO TO 320
C
DO 310 K=1,NP
C
READ (MP,30) (PNAME(J,K),J=1,4)
WRITE (MT'K) (PNAME(J,K),J=1,4)
IYEAR=0
C
DO 300 YEAR=FYEAR,LYEAR
C

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```

MONTH(11)=28
IF (MOD(YEAR+1,4).EQ.0) MONTH(11)=29
IADD=0
IF(MOD(YEAR+1,4).EQ.0) IADD=1
C
P(366)=0.
IYEAR=IYEAR+1
C
IF (MPF .EQ. 1) CALL CARDI(MONTH,MP,P)
IF (MPF .EQ. 2) CALL TAPEI(MONTH,MP,P)
IF (MPF .EQ. 3) CALL CAD6D(INDEX,IADD,MP,P)
IF (MPF .EQ. 4) CALL CAD4D(INDEX,IADD,MP,P)
C
IF (IEVAP .EQ. 0)
1IRP = NYEAR + (IYEAR-1)*NP*KR + (K-1)*KR + 1
IF (IEVAP .EQ. 1)
1IRP = NYEAR + (IYEAR-1)*(NP+1)*KR + (K-1)*KR + 1
WRITE (D2'IRP) (P(I),I=1,366)
C
300 CONTINUE
C
READ (MP,30)
C
310 CONTINUE
C
320 IF (ISNOW.EQ.0) GO TO 500
C
DO 420 J=1,2
C
IF (J .EQ. 1) MD=MH
IF (J .EQ. 2) MD=MC
IF (J .EQ. 1) MDF=MHF
IF (J .EQ. 2) MDF=MCF
IF (MD .EQ. 0) GO TO 420
IF (MDF .LE. 0 .OR. MDF .GT. 4) GO TO 420
C
DO 410 K=1,NP
C
READ (MD,30) TNAME
IYEAR=0
C
DO 400 YEAR=FYEAR,LYEAR
C
MONTH(11)=28
IF (MOD(YEAR+1,4).EQ.0) MONTH(11)=29
IADD=0
IF(MOD(YEAR+1,4).EQ.0) IADD=1
C
T(366)=0.
IYEAR=IYEAR+1
C
IF (MDF .EQ. 1) CALL CARDI(MONTH,MD,T)
IF (MDF .EQ. 2) CALL TAPEI(MONTH,MD,T)
IF (MDF .EQ. 3) CALL CAD6D(INDEX,IADD,MD,T)
IF (MDF .EQ. 4) CALL CAD4D(INDEX,IADD,MD,T)
C
IRT = NYEAR + (IYEAR-1)*NP*KR + (K-1)*KR + J + 1
WRITE (D2'IRT) (T(I),I=1,366)
400 CONTINUE
C
READ (MD,30)
C

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```

410 CONTINUE
C
420 CONTINUE
C
500 RETURN
    END
C
        INPUT CARD FORMAT
C
        SUBROUTINE CARDI (MONTH,MD,D)
        DIMENSION MONTH(1),D(1)
        IE=0
        DO 200 M=1,12
        IS=IE+1
        IE=IE+MONTH(M)
200 READ (MD,21) (D(I),I=IS,IE)
    21 FORMAT (14X,10F6.0,/,14X,10F6.0,/,14X,11F6.0)
        RETURN
        END
C
        INPUT TAPE FORMAT
C
        SUBROUTINE TAPEI (MONTH,MD,D)
        DIMENSION MONTH(1),D(1)
        IE=0
        DO 300 M=1,12
        IS=IE+1
        IE=IE+MONTH(M)
300 READ (MD,40) (D(I),I=IS,IE)
    40 FORMAT (14X,31F6.0)
        RETURN
        END
C
        INPUT CARD 6D FORMAT IN   S S A R R   MODEL
C
        SUBROUTINE CAD6D(INDEX,IADD,MD,D)
        DIMENSION INDEX(13),D(366),DUMM(8)
C
        DO 120 J=1,366
120 D(J)=0.
C
        READ 6D RECORDS
        END OF THIS SET BY BLANK IN 6D RECORD, OR
        ENTERED DAY=99, MONTH=99 AND YEAR=9999
C
405 READ(MD,12) CODE, ID, MON, IY, (DUMM(II), II=1,8)
    12 FORMAT(A2,15X,3I2,1X,8F7.1)
        IF (ID .EQ. 99) ID=0
        IF (MON .EQ. 99) MON=0
        IF(ID.EQ.0.OR.MON.EQ.0) GO TO 409
        M1=INDEX(MON)+ID-1
        M2=M1+7
        IF(ID.GE.25) M2=INDEX(MON+1)-1
        IF(MON.GE.11.AND.M1.GE.331) M2=M2+IADD
C
        IF(MON.GE.2.AND.M1.GE.56) M2=M2+IADD
        IF(MON.GE.11.AND.M1.GE.331) M1=M1+IADD
C
        IF(MON.GE.2.AND.M1.GE.56) M1=M1+IADD
C
        II=1
        DO 408 I=M1,M2
        D(I)=DUMM(II)
        II=II+1
408 CONTINUE

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```

C
GO TO 405
409 RETURN
END

C
C INPUT CARD 4D FORMAT IN S S A R R MODEL
C
SUBROUTINE CAD4D(INDEX,IADD,MD,D)
DIMENSION INDEX(13),D(366),DUMM(14)

C
DO 120 J=1,366
120 D(J)=0.

C
C READ 4D RECORDS
C END OF THIS SET BY BLANK IN 6D RECORD, OR
C ENTERED DAY=99, MONTH=99 AND YEAR=9999
C
411 READ(MD,13) CODE, ID, MON, IY, (DUMM(II), II=1, 14)
13 FORMAT(A2, 15X, 3I2, 1X, 14F4.1)
IF (ID .EQ. 99) ID=0
IF (MON .EQ. 99) MON=0
IF (ID.EQ.0.OR.MON.EQ.0) GO TO 415
M1=INDEX(MON)+ID-1
M2=M1+13
IF (ID.GE.25) M2=INDEX(MON+1)-1
IF (MON.GE.11.AND.M1.GE.334) M2=M2+IADD
C IF (MON.GE.2.AND.M1.GE.59) M2=M2+IADD
C IF (MON.GE.11.AND.M1.GE.334) M1=M1+IADD
C IF (MON.GE.2.AND.M1.GE.59) M1=M1+IADD
C
II=1
DO 414 I=M1,M2
D(I)=DUMM(II)
II=II+1
414 CONTINUE

C
GO TO 411
415 RETURN
END

C
C SUBROUTINE FOR TANK MODEL CALCULATION
C IF IDISK = 0, CALCULATED RESULTS DO NOT STORE IN DATA SET D3
C
SUBROUTINE TNK4X4 (IDISK,SAVEX)

C
C DEFINE FILE 2(200,370,U,ID2)
C DEFINE FILE 3 (100,370,U,ID3)
C DEFINE FILE 8 (1600,20,U,ID8)
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
1, ANAME(20),PNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2, D8,ID8
INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,D8,SAVEX
COMMON /PRM/ S1,S2,HA1,HA2,A0,A1,A2,HB1,B0,B1,HC1,C0,C1
1, HD1,D0,D1,LAG,E(12),CE(12),K1,K2,CP(10),WE(10),CM(12)
REAL K1,K2
COMMON /HS/ HS
COMMON /CPM/ CPM(12)
COMMON /AR/ AR(4)
COMMON /ID/ XE,E1,E2,XEI
DIMENSION XE(10)
COMMON /X/ XA(4,10),XS(4,10),XB(4,10),XC(4,10),XD(4,10)
COMMON /Y/ QEI(380,5),Q(380),P(370),EVAP(370),QE(370),DUM(370,2)

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```

DIMENSION MONTH(12),Y(5),R(4)
DATA MONTH/31,28,31,30,31,30,31,31,30,31,30,31/
C
C           SET RELATIVE POSITIONS OF DATA SETS D2, D3 AND D8
C
      ID2=NYEAR+1
      ID3=1
      ID8=1
C
      R(1) = 0.
      DO 300 L=2,4
      R(L) = AR(L-1)/AR(L)
300 CONTINUE
C
      DO 310 K=1,NP
      XE(K) = XEI
310 CONTINUE
C
C           BEGINNING OF YEAR LOOP
C
      LYR=FYEAR+NYEAR-1
      DO 600 YEAR=FYEAR,LYR
C
C           SETTING FOR LEAP YEAR
C
      MONTH(2)=28
      IYR=YEAR
      IF (FMONTH .GT. 2) IYR=YEAR+1
      IF (MOD(IYR,4).EQ.0) MONTH(2)=29
C
C           INITIALIZING ST, QE AND QEI TO ZERO
C
      DO 410 J=1,366
      QE(J)=0.
      DO 400 I=1,5
400 QEI(J,I)=0.
410 CONTINUE
C
C
C           IF IEVAP IS EQUAL TO 1, READ DAILY
C           EVAPOTRANSPIRATION DATA FOR ONE YEAR
C
      IF (IEVAP .EQ. 1) READ (D2'ID2) (EVAP(I),I=1,366)
C
C           BEGINNING OF RAINFALL STATION LOOP
C
      DO 490 K=1,NP
C
C           READING PRECIPITATION (ONE YEAR)
C           FOR ONE STATION
C
      READ (D2'ID2) (P(J),J=1,366)
C
      JE=0
      LM=FMONTH+11
      IF (YEAR .EQ. LYR) LM=LMONTH
      IF (LM .LT. FMONTH) LM=LM+12
      DO 480 MON=FMONTH,LM
      M=MON
      IF (M .GT. 12) M=M-12
C
C           CALCULATION OF TANK MODEL FOR ONE MONTH

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```

C      JS=JE+1
      JE=JE+MONTH(M)
C
      DO 460 J=JS,JE
      DO 420 I=1,5
420    Y(I) = 0.
C
C      ADJUSTING PRECIPITATION USING INCREASING
C      COEFFICIENT FOR THE MONTH
C
      PY = P(J) * CPM(M)
C
      EV=E(M)
      IF (IEVAP .EQ. 1) EV=EVAP(J)
      EV=EV*CE(M)
C
C      SUBTRACTING EVAPOTRANSPIRATION
C
      DO 430 L=1,4
      CALL EVPTRW (EV,K1,K2,S1,S2,XA(L,K),XS(L,K),XB(L,K)
1,      XC(L,K),XD(L,K))
C
C      TANK MODEL CALCULATION FOR ONE DAY
C
      CALL TANKSS (PY,XA(L,K),Y2,Y1,YA0,HA1,HA2,S1,A0,A1,A2,HS)
      Y(1) = Y(1) + Y2*AR(L)
      Y(2) = Y(2) + Y1*AR(L)
C
      PB = YA0 + Y(3) * R(L)
      CALL TANKB (PB, XB(L,K),Y(3),YB0,HB1,B0,B1)
      PC = YB0 + Y(4) * R(L)
      CALL TANKB (PC, XC(L,K),Y(4),YC0,HC1,C0,C1)
      PD = YC0 + Y(5) * R(L)
      CALL TANKB (PD, XD(L,K),Y(5),YD0,HD1,D0,D1)
430    CONTINUE
C
      DO 440 I=3,5
440    Y(I) = Y(I) * AR(4)
C
C      STORING EACH OUTPUT FROM OUTLET OF TANK
C      TO QEI WHICH ARE SUMMED UP USING RAINFALL
C      STATION WEIGHT
C
      YY=0.
      DO 450 I=1,5
      YY=YY+Y(I)
      QEI(J,I)=QEI(J,I)+Y(I)*WE(K)
450    CONTINUE
C
      CALL TANKID (YY, XE(K), YY, E1, E2)
      QE(J) = QE(J) + YY * WE(K)
C
460    CONTINUE
C
C      WRITING STORAGES TO DATA SET DB
C      FOR FINAL PRINTING
C
      IF (SAVEX .EQ. 0) GO TO 480
      WRITE (DB>IDB) (XA(L,K),XS(L,K),XB(L,K),XC(L,K),XD(L,K)
1,      L=1,4)
C

```

```
480 CONTINUE
C
490 CONTINUE
C
C           SKIPPING THE WRITING OF QEI, QE AND ST
C           IN CASE OF IDISK=0
C
IF (IDISK.EQ.0) GO TO 600
C
C           WRITING QE, QEI
C
C           DATA ARRANGEMENT IN DATA SET D3 IS AS FOLLOWS:
C           QE (FIRST YEAR)
C           QEI (1 -- 5) (FIRST YEAR)
C           QE (SECOND YEAR)
C           QEI (1 -- 5) (SECOND YEAR)
C
C
WRITE (D3'ID3) (QE(J),J=1,366)
DO 500 I=1,5
C 500 WRITE (D3'ID3) (QEI(J,I),J=1,366)
C
600 CONTINUE
RETURN
END
SUBROUTINE TANKSS(P,XA,Y2,Y1,Y0,HA1,HA2,S1,A0,A1,A2,HS)
XA = XA + P
Y2 = 0.
Y1 = 0.
Y0 = 0.
IF (XA .LE. S1) RETURN
XF = XA - S1
IF (XF .LE. HA1) GO TO 100
Y1 = (XF - HA1) * A1
IF (XF .LE. HA2) GO TO 100
Y2 = (XF - HA2) * A2
100 IF (XF .GT. HS) XF = HS
Y0 = XF * A0
XA = XA - Y0 - Y1 - Y2
RETURN
END
SUBROUTINE TANKID(Q, XE, Y, E1, E2)
XE = XE + Q
Y = (SQRT(E1**2 + 2.*E2*XE) - E1) / E2
XE = XE - Y
RETURN
END
C
C           SUBROUTINE FOR EXTRACTING EVAPOTRANSPIRATION AND FOR
C           CALCULATION OF TRANSFER VALUE FROM LOWER TANK TO UPPER TANK
C
SUBROUTINE EVPTRW (EV,K1,K2,S1,S2,XA,XS,XB,XC,XD)
C
REAL K1,K2
C
C           EXTRACTING EVAPOTRANSPIRATION FROM FIRST TANK
C
XA=XA-EV
C
C           IF QUANTITY OF FIRST TANK BECOMES LESS THAN
C           ZERO, IT IS SET TO ZERO, AND EVEN IN THIS CASE,
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C           EXTRACTION FROM LOWER TANK IS NOT OCCURED.
C
C           IF (XA .LT. 0.) XA=0.
C
C           QUANTITY OF PRIMARY SOIL MOISTURE IS SET TO 0
C           (IF XA IS EQUAL TO ZERO), TO S1 (IF XA IS
C           GREATER THAN S1), AND TO XA (OTHERWISE).
C
C           XP=XA
C           IF (XA .GT. S1) XP=S1
C
C           CALCULATION OF TRANSFER VALUE (T1) FROM
C           LOWER TANK TO PRIMARY SOIL MOISTURE AND
C           TRANSFER VALUE (T2) FROM PRIMARY SOIL
C           MOISTURE TO SECONDARY SOIL MOISTURE.
C           AFTER SUBTRACTING T1 FROM XB, IF XB IS
C           LESS THAN ZERO, REMAINED QUANTITY IS
C           SUBTRACTED FROM LOWER TANKS.
C
C           T1=K1*(1.-XP/S1)
C           T2=K2*(XP/S1-XS/S2)
C
C           XA=XA+T1-T2
C           XS=XS+T2
C           XB=XB-T1
C
C           IF (XB.GE.0.) RETURN
C
C           XC=XC+XB
C           XB=0.
C           IF (XC.GE.0.) RETURN
C
C           XD=XD+XC
C           XC=0.
C           IF (XD .GE. 0.) RETURN
C
C           XA=XA+XD
C           XD=0.
C           RETURN
C           END
C
C           SUBROUTINE FOR CALCULATION OF 2ND, 3RD AND 4TH TANK
C
C           SUBROUTINE TANKB(P,X,Y,Y0,HB,B0,B1)
C
C           X=X+P
C           Y=0.
C           IF (X .GT. HB) Y=(X-HB)*B1
C           Y0=X*B0
C           X=X-Y0-Y
C
C           RETURN
C           END
C
C           SUBROUTINE FOR DETERMINING INITIAL STORAGE
C
C           SUBROUTINE INVAL3 (N,NP,XA,XS,XB,XC,XD)
C
C           DIMENSION XA(NP),XS(NP),XB(NP),XC(NP),XD(NP)
C           DIMENSION XA1(30),XB1(30),XC1(30),XD1(30),XS1(30)
C           DIMENSION XA2(30),XB2(30),XC2(30),XD2(30),XS2(30)

```



```

C      FX(X1,X2,X3) = X1 + (X2-X1)**2 / (2.*X2 - X1 - X3)
C
C      GO TO (100,200,300), N
C
100 DO 110 K=1,NP
    XA1(K)=XA(K)
    XS1(K)=XS(K)
    XB1(K)=XB(K)
    XC1(K)=XC(K)
    XD1(K)=XD(K)
110 CONTINUE
    RETURN
C
200 DO 210 K=1,NP
    XA2(K)=XA(K)
    XS2(K)=XS(K)
    XB2(K)=XB(K)
    XC2(K)=XC(K)
    XD2(K)=XD(K)
210 CONTINUE
    RETURN
C
300 DO 350 K=1,NP
    IF (XA1(K) .EQ. XA2(K)) GO TO 310
    XA(K) = FX(XA1(K),XA2(K),XA(K))
    IF (XA(K) .LT. 0.) XA(K)=0.
C
310 IF (XS1(K) .EQ. XS2(K)) GO TO 320
    XS(K) = FX(XS1(K),XS2(K),XS(K))
    IF (XS(K) .LT. 0.) XS(K)=0.
C
320 IF (XB1(K) .EQ. XB2(K)) GO TO 330
    XB(K) = FX(XB1(K),XB2(K),XB(K))
    IF (XB(K) .LT. 0.) XB(K)=0.
C
330 IF (XC1(K) .EQ. XC2(K)) GO TO 340
    XC(K) = FX(XC1(K),XC2(K),XC(K))
    IF (XC(K) .LT. 0.) XC(K)=0.
C
340 IF (XD1(K) .EQ. XD2(K)) GO TO 350
    XD(K) = FX(XD1(K),XD2(K),XD(K))
    IF (XD(K) .LT. 0.) XD(K)=0.
350 CONTINUE
    RETURN
    END
C
C      SUBROUTINE FOR SETTING MASKED OBSERVED DISCHARGE TO MINUS
C      SUBROUTINE QMASK (YEAR,SMONTH,SDAY,EMONTH,EDAY)
C
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
1,      ANAME(20),PNAME(4,10),MT,D2,D3,D4,D7,ID2
DIMENSION Q(366),MONIH(12)
INTEGER YEAR,SMONTH,SDAY,EMONTH,EDAY,FYEAR,FMONTH,D2
DATA MONTH /31,28,31,30,31,30,31,31,30,31,30,31/
C
C      SETTING RELATIVE POSITION IN DATA SET D2
C      TO OBSERVED DISCHARGE OF TARGET YEAR
C
IYR = YEAR
IF (SMONTH .LT. FMONTH) IYR=IYR-1

```



```

      IRQ = IYR - FYEAR + 1
C
C           READING OBSERVED DISCHARGE OF TARGET YEAR
C
      READ (D2'IRQ) (Q(I),I=1,366)
C
C           SETTING FOR LEAP YEAR
C
      IF (FMONTH .GT. 2) IYR = IYR + 1
      MONTH(2) = 28
      IF (MOD(IYR, 4) .EQ. 0) MONTH(2) = 29
C
C           CONSIDERATION OF THE CASE WHERE SMONTH
C           OR EMONTH IS LESS THAN FMONTH
C
      MS = SMONTH
      ME = EMONTH
      IF (MS .LT. FMONTH) MS = MS + 12
      IF (ME .LT. FMONTH) ME = ME + 12
C
C           GETTING FIRST DAY'S NUMBER AND LAST
C           DAY'S NUMBER OF MASKED PERIOD
C
      IS = 0
      IE = 0
      DO 100 MON = FMONTH,ME
      M = MON
      IF (M .GT. 12) M = M - 12
      IF (MON .LT. MS) IS = IS + MONTH(M)
      IF (MON .LT. ME) IE = IE + MONTH(M)
100 CONTINUE
      IS = IS + SDAY
      IE = IE + EDAY
C
C           SETTING MASKED OBSERVED DISCHARGE TO MINUS
C
      DO 200 I=IS,IE
      IF (Q(I) .NE. -999.) Q(I) = SIGN(Q(I) + 1.E4, -1.)
200 CONTINUE
C
C           REWRITING OBSERVED DISCHARGE INTO
C           DATA SET D2
C
      210 WRITE (D2'IRQ) (Q(I),I=1,366)
C
      RETURN
      END
C
C           SUBROUTINE FOR THAT CALCULATED DISCHARGES ARE SHIFTED
C           USING TIME LAG
C
      SUBROUTINE QELAG (LAG)
C
      DEFINE FILE 3 (100,370,U,ID3)
C
      COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAF
1,          ANAME(20),PNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2,          DB,ID8
      INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,DB
      COMMON /Y/ QEI(380,5),QE(380),DUMMY(370,5)
C
C           IF LAG=0, THIS SUBROUTINE IS DISREGARDED

```

```

C      IF (LAG.EQ.0) RETURN
C
C      SETTING TAIL OF QEI TO ZERO
C
C      DO 300 J=366,370
C      QE(J)=0.
C      DO 300 I=1,5
C      QEI(J,I)=0.
300  CONTINUE
C
C      SETTING RELATIVE POSITION OF D3 TO 1
C
C      IR=1
C
C      START OF SHIFTING
C
C      LYR=FYEAR+NYEAR-1
C      DO 330 YEAR=FYEAR,LYR
C
C      LEAP YEAR CONSIDERATION
C
C      IYR=YEAR
C      IF (FMONTH .GT. 2) IYR=IYR+1
C      JLAG=365
C      IF (MOD(IYR-1,4).EQ.0) JLAG=366
C
C      SHIFTING TAIL OF QEI OF LAST YEAR TO
C      BEGINNING OF QEI OF THIS YEAR
C
C      DO 310 J=1,LAG
C      QE(J)=QE(J+JLAG)
C      DO 310 I=1,5
C      QEI(J,I)=QEI(J+JLAG,I)
310  CONTINUE
C
C      READING QEI FROM D3 USING TIME LAG,
C      AND WRITING AGAIN SHIFTED VALUES TO D3
C
C      JS=1+LAG
C      JE=366+LAG
C      READ (D3'IR) (QE(J),J=JS,JE)
C      WRITE(D3'IR) (QE(J),J=1,366)
C      IR=IR+1
C      DO 320 I=1,5
C      READ (D3'IR) (QEI(J,I),J=JS,JE)
C      WRITE (D3'IR) (QEI(J,I),J=1,366)
320  IR=IR+1
C
C      BYPASSING SNOW DEPOSIT IN D3
C
C      IR=IR+ISNOW
C
C      330 CONTINUE
C      RETURN
C      END
C
C      SUBROUTINE FOR CALCULATION OF CRITERIA RQ, RD FOR
C      PARAMETER ADJUSTMENT AND CALCULATION OF CRITERION CR
C      FOR MATCHING (DURATION CURVE METHOD)
C
C      SUBROUTINE DCCR (NO, CR, CC, LAG, Q0)

```

```

C
C   DEFINE FILE 2 (200,370,U,ID2)
C   DEFINE FILE 3 (100,370,U,ID3)
C   DEFINE FILE 7(20,370,U,ID7)
COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
1,      ANAME(20),FNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2,      D8,ID8
INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,D8
COMMON /CRIT/ RQ(5),RD(5),MAX1,MAX2,NI(5),ND(5),IDAY,NN,
1      MSEQ,MSELQ,MSEDC,MSELDC,CRHY,CRDC
COMMON /Y/   QEI(380,5),Q(380),QE(370),QNO(370),QENO(370),
1      QLOG(370),QELOG(370)
COMMON /FB/  IRQFB(5),IRDFB(4)
INTEGER QNO,QENO,NWRK(370)
REAL SQ(5),SQL(5),SQR(5),SQE(5),SQEL(5),SQER(5),
1      MSEQ,MSELQ,MSEDC,MSELDC,RX(10)
INTEGER N(5),NC(5),NDC(5)

C
C
C           INITIALIZING EACH VARIABLE FOR EACH
C           SUBSECTION TO ZERO
C
DO 590 I=1,5
SQ(I)=0.
SQL(I)=0.
SQR(I)=0.
SQE(I)=0.
SQEL(I)=0.
SQER(I)=0.
NI(I)=0
590 CONTINUE

C
C
C           INITIALIZING VARIOUS DATA TO ZERO
C
MSEDC=0.
MSELDC=0.
MSEQ=0.
MSELQ=0.
SQO=0.
DAY=0.

C
C
C           SETTING RELATIVE POSITION OF EACH DATA SET TO 1
C
ID2=1
ID3=1
ID7=1

C
C
C           BEGINNING OF YEAR LOOP
C
LYR=FYEAR+NYEAR-1
DO 850 YEAR=FYEAR,LYR

C
C
C           READING CALCULATED DISCHARGE FOR EACH
C           SUBSECTION AND OBSERVED DISCHARGE (ONE YEAR)
C
READ (D3'ID3) (QE(J),J=3,368)
DO 600 I=1,5
600 READ (D3'ID3) (QEI(J,I),J=3,368)
READ (D2'ID2) (Q(J),J=3,368)

C
C
C           DISREGARDING SNOW DEPOSIT IN D3

```



```

ID3=ID3+ISNOW
C
IF (YEAR.GT.FYEAR) GO TO 620
C
C           IN FIRST YEAR, BEGINNING OF YEAR IS SET TO
C           -999. USING TIME LAG
C
JL=LAG+2
DO 610 J=1,JL
610 Q(J)=-999.
   QLOG(2)=-999.
C
C           LEAP YEAR CONSIDERATION
C
620 IYR=YEAR
   IF (FMONTH .GT. 2) IYR=IYR+1
   JN=365
   IF (MOD(IYR, 4).EQ.0) JN=366
   JE=JN+2
C
C           SETTING NUMBER OF DAYS OF EACH SUBSECTION
C           TO ZERO
C
DO 625 I=1,5
625 N(I)=0.
C
DO 670 J=3,JE
C
C           SUMMING UP ALL CALCULATED SUBSECTION
C           DISCHARGE TO CALCULATED DAILY DISCHARGE
C
YY=0.
DO 630 I=1,5
630 YY=YY+QEI(J,I)
   YY=YY+Q0
   QE(J)=QE(J)+Q0
C
C           DETERMINING SUBSECTION NUMBER I
C
C           IF QEI(J,1) NOT SMALLER THAN QE(J)*CC,
C           DAY J BELONGS TO SUBSECTION 1,
C           IF QEI(J,1)+QEI(J,2) NOT SMALLER THAN
C           QE(J)*CC, DAY J BELONGS TO SUBSECTION 2,
C           .
C           .
C           IF QEI(J,1)+...+QEI(J,4) NOT SMALLER THAN
C           QE(J)*CC, DAY J BELONGS TO SUBSECTION 4,
C           OTHERWISE, DAY J BELONGS TO SUBSECTION 5
C
Y=YY*CC
C
YI=0.
DO 640 I=1,4
YI=YI+QEI(J,I)
IF (YI.GE.Y) GO TO 650
640 CONTINUE
   I=5
650 CONTINUE
C
C           IF OBSERVED DISCHARGE GREATER THAN ZERO,
C           QE(J) IS ENTERED INTO QEI(J,1) AND

```

```

C           NUMBER OF DAYS (N) IN ONE YEAR BELONG TO
C           SUBSECTION I IS INCREASED BY ONE, OTHERWISE
C           QEI(J,1) IS SET TO -999.
C
C           QEI(J,1)=-999.
C           IF (Q(J)+Q0 .LT. 0.) GO TO 670
C           Q(J)=Q(J)+Q0
C           QEI(J,1)=QE(J)
C           N(I)=N(I)+1
670 CONTINUE
C
C           NUMBER OF DAYS (NI) IN ALL YEARS AND HALF OF
C           NUMBER OF DAYS, EACH BELONG TO SUBSECTION I,
C           ARE CALCULATED.
C
C           DO 680 I=1,5
C           NI(I)=NI(I)+N(I)
680 NC(I)=(N(I)+1)/2
C
C           NUMBER OF DAYS FROM BEGINNING OF ALL DATA
C           IN ONE YEAR TO LAST POINT (N) AND TO CENTER
C           POINT (NDC) OF SUBSECTION I ARE CALCULATED.
C
C           DO 690 I=2,5
C           N(I)=N(I-1)+N(I)
C           NC(I)=N(I-1)+NC(I)
C           NDC(I)=NC(I)
690 CONTINUE
C
C           SUBSECTION 1 AND SUBSECTION 2 ARE COMBINED,
C           THEN NDC(2) MUST BE CALCULATED AGAIN.
C
C           NDC(2)=(N(2)+1)/2
C
C           IF (NO .GE. 2) GO TO 701
C           QNO(368)=0
C           CALL ORDER (Q(3),QNO(3),JN,NWRK)
C           WRITE (D7'ID7) QNO
C
C           AT FIRST TIME, ALOG(Q(J)) ARE CALCULATED, AND
C           STORED IN QLOG(J). THEN, QLOG(J) ARE STORED
C           IN D7
C
C           DO 700 J=3,JE
C           QLOG(J)=-999.
C           IF (Q(J) .GT. 0.) QLOG(J)=ALOG(Q(J))
700 CONTINUE
C           WRITE (D7'ID7) QLOG
C           GO TO 705
C
C           ORDERED Q(J) AND ALOG(Q(J)) ARE READ FROM D7
701 READ (D7'ID7) QNO
C           READ (D7'ID7) QLOG
C
C           THE CALCULATED DISCHARGES ARE ARRANGED BY
C           DESCENDING ORDER AND THESE ARRANGED DISCHARGES
C           ARE GIVEN THE SEQUENCE NUMBER (QENO)
705 QENO(368)=0
C           CALL ORDER (QEI(3,1),QENO(3),JN,NWRK)
C

```

```

C                                     ALOG(QE(J)) ARE CALCULATED, AND STORED IN
C                                     QELOG(J).
C
DO 706 J=3,JE
IF (QE(J) .GT. 0.) QELOG(J)=ALOG(QE(J))
706 CONTINUE
C
C                                     CALCULATION FOR ONE YEAR
C
DO 820 J=3,JE
C
C                                     IF QNO(J)=0, DAY J IS DISREGARDED.
C
IF (QNO(J).EQ.0) GO TO 820
C
C                                     IF QNO(J) IS NOT GREATER THAN N(I),
C                                     Q(J) OF DAY J IS ADDED TO SQ(I)
C
DO 710 I=1,5
IF (QNO(J).LE.N(I)) GO TO 720
710 CONTINUE
720 SQ(I)=SQ(I)+Q(J)
C
C                                     IF QNO(J) IS GREATER THAN NDC(I), Q(J) OF
C                                     DAY J IS ADDED TO SQR(I), OTHERWISE, Q(J)
C                                     IS ADDED TO SQL(I).
C
IF (I.EQ.1) I=2
IF (QNO(J).GT.NDC(I)) GO TO 730
SQL(I)=SQL(I)+Q(J)
GO TO 740
730 SQR(I)=SQR(I)+Q(J)
C
C                                     IF QENO(J) IS NOT GREATER THAN N(I), QE(J) OF
C                                     DAY J IS ADDED TO SQE(I)
C
740 DO 750 I=1,5
IF (QENO(J).LE.N(I)) GO TO 760
750 CONTINUE
760 SQE(I)=SQE(I)+QE(J)
C
C                                     IF QENO(J) IS GREATER THAN NDC(I), QE(J) OF
C                                     DAY J IS ADDED TO SQER(I), OTHERWISE, QE(J) IS
C                                     ADDED TO SQEL(I).
C
IF (I.EQ.1) I=2
IF (QENO(J).GT.NDC(I)) GO TO 770
SQEL(I)=SQEL(I)+QE(J)
GO TO 780
770 SQER(I)=SQER(I)+QE(J)
780 CONTINUE
C
C                                     SEARCHING QENO(I) WHICH IS EQUAL TO QNO(J) OF
C                                     DAY J.
C
DO 800 I=3,JE
IF (QENO(I).EQ.QNO(J)) GO TO 810
800 CONTINUE
C
810 MSED C=MSED C+(QE(I)-Q(J))**2
MSELDC=MSELDC+(QELOG(I)-QLOG(J))**2
820 CONTINUE

```

```

C      JS=2
      IF (YEAR .EQ. FYEAR) JS=3
      JE=JN+1
      IF (YEAR .LT. LYR) GO TO 830
      JE=JE+1
      Q(JE+1)=-999.
      QLOG(JE+1)=-999.
830  CONTINUE
C
      DO 840 J=JS,JE
C
      IF (Q(J) .LE. 0.) GO TO 840
C
      MINIMUM QUANTITY AMONG THREE ADJOINING (QE-Q)
      IS SELECTED FOR MSEQ
C
      DQ0 = (QE(J) - Q(J-1)) ** 2
      DQ1 = (QE(J) - Q( J )) ** 2
      DQ2 = (QE(J) - Q(J+1)) ** 2
      DQ=AMIN1(DQ0,DQ1,DQ2)
      MSEQ=MSEQ+DQ
C
      MINIMUM QUANTITY AMONG THREE ADJOINING
      (ALOG(QE)-ALOG(Q)) IS SELECTED FOR MSELQ
C
      DQL0 = (QELOG(J) - QLOG(J-1)) ** 2
      DQL1 = (QELOG(J) - QLOG( J )) ** 2
      DQL2 = (QELOG(J) - QLOG(J+1)) ** 2
      DQL = AMIN1 (DQL0, DQL1, DQL2)
      MSELQ = MSELQ + DQL
C
      GETTING SUM OF Q(J) AND NUMBER OF DAY
      SUMMED UP
C
      SQO=SQO+Q(J)
      DAY=DAY+1.
840  CONTINUE
C
      SHIFTING Q AND QE OF LAST DAY TO FIRST DAY OF
      NEXT YEAR
C
      Q(1) = Q(JE)
      Q(2) = Q(JE+1)
      QE(2) = QE(JE+1)
      QLOG(1) = QLOG(JE)
      QLOG(2) = QLOG(JE+1)
      QELOG(2) = QELOG(JE+1)
C
850  CONTINUE
C
      DO 860 I=1,5
      RQ(I)=1.
      RD(I)=1.
      RX(I)=0.
860  RX(I+5)=0.
C
      GETTING RQ FOR EACH SUBSECTIONS
C
      DO 861 I=1,5
      IF (IRQFB(I) .EQ. 1) GO TO 861
      IF (NI(I).EQ.0) GO TO 861

```



```

      RQ(I)=SQE(I)/SQ(I)
861 CONTINUE
C
C           GETTING RD FOR EACH SUBSECTIONS AND
C           ADJUSTING RD
C
      DO 862 I=2,4
      IF (IRDFB(I) .EQ. 1) GO TO 862
      IF (NI(I) .EQ. 0) GO TO 862
      RD(I)=(SQEL(I)-SQER(I))/(SQL(I)-SQR(I))
      RD(I)=(1.+RD(I))*0.5
862 CONTINUE
C
C           GETTING RX = (ABS(RQ-1.) OR ABS(RD-1.)).
C           IF NUMBER OF DAY IN SUBSECTION I IS LESS THAN
C           OR EQUAL TO NN = (NUMBER OF YEAR)*4,
C           CALCULATION OF RX ARE SKIPPED.
C
      NN=NYEAR*4
C
      DO 870 I=1,5
      IF (NI(I) .GT. NN) RX(I) = ABS(RQ(I) - 1.)
870 CONTINUE
C
      DO 871 I=2,4
      IF (NI(I) .GT. NN) RX(I+5) = ABS(RD(I) - 1.)
871 CONTINUE
C
      MSEQ=SQRT(MSEQ*DAY)/SQO
      MSELQ=SQRT(MSELQ/DAY)
      MSEDQ=SQRT(MSEDQ*DAY)/SQO
      MSELDC=SQRT(MSELDC/DAY)
C
C           CALCULATING CRITERIA FOR BEST FIT
C
      CRHY=(MSEQ+MSELQ)*0.5
      CRDC=(MSEDQ+MSELDC)*0.5
      CR = CRHY + CRDC
C
C           GETTING MAXIMUM AMONG RX AND SECOND MAXIMUM
C           AMONG RX
C
      MAX1=1
      DO 880 I=2,9
      IF (RX(I) .GT. RX(MAX1)) MAX1=I
880 CONTINUE
      MAX2=1
      IF (MAX1 .EQ. 1) MAX2=2
      DO 890 I=2,9
      IF (I .NE. MAX1 .AND. RX(I) .GT. RX(MAX2)) MAX2=I
890 CONTINUE
      RETURN
      END
C
C           SUBROUTINE FOR ORDERING
C           Q(1) TO Q(JN) ARE ARRANGED BY DESCENDING ORDER AND
C           ARRANGED Q ARE GIVEN THE SEQUENCE NUMBER (QNO). IN FACT,
C           THE ORDER OF Q IS NOT CHANGE. THAT IS, THE CONTENT OF
C           QNO(J) IS SET TO K, IF THE ORDER NUMBER OF Q(J) EQUAL TO K.
C
      SUBROUTINE ORDER (Q, QNO, JN, NO)
      COMMON /ORD/ NY, Y(50)

```

```

DIMENSION Q(JN), N(50), NS(50), NO(JN)
INTEGER QNO(JN)
C
DO 100 K=1,NY
100 N(K)=0
C
DO 150 J=1,JN
C
C           AT FIRST, Q(J) ARE CLASIFIED IN NY GROUPS.
C           AND QNO(J) IS SET TO K, IF Q(J) BELONGS TO
C           K-TH GROUP. (NY MUST BE EQUAL OR SMALLER
C           THAN 50)
C
DO 110 K=1,NY
IF (Q(J).GT.Y(K)) GO TO 120
110 CONTINUE
QNO(J)=0
GO TO 150
C
120 QNO(J)=K
C
C           N(X) IS SET TO THE NUMBER OF DATA BELONG
C           TO GROUP K
C
N(K)=N(K)+1
150 CONTINUE
C
C           NS(K) IS SET TO THE ACCUMULATED NUMBER.
C           (NS(1)=0, NS(2)=N(1), NS(3)=N(1)+N(2).)
C
NS(1)=0
DO 160 K=2,NY
160 NS(K)=NS(K-1)+N(K-1)
C
DO 170 K=1,NY
170 N(K)=0
C
DO 180 J=1,JN
IF (QNO(J).EQ.0) GO TO 180
K=QNO(J)
N(K)=N(K)+1
I=N(K)+NS(K)
NO(I)=J
180 CONTINUE
C
DO 300 K=1,NY
IF (N(K).EQ.0) GO TO 300
C
IS=NS(K)+1
IE=NS(K)+N(K)
C
DO 210 I=IS,IE
C
MAX=I
JM=NO(MAX)
C
DO 200 II=I,IE
J=NO(II)
IF (Q(JM).GE.Q(J)) GO TO 200
MAX=II
JM=NO(MAX)
200 CONTINUE

```

```

C      IW=NO(I)
C      NO(I)=NO(MAX)
C      NO(MAX)=IW
C
C      210 CONTINUE
C      300 CONTINUE
C
C      IN = NS(NY) + N(NY)
C
C      IF (IN .EQ. 0) RETURN
C      DO 400 I=1, IN
C      J=NO(I)
C      QNO(J)=I
C      400 CONTINUE
C
C      RETURN
C      END
C
C      SUBROUTINE FOR GETTING MODIFIED OBSERVED DISCHARGE
C      BY USING TIME LAG (TLAG)
C
C      SUBROUTINE QLAG (TLAG)
C
C      DEFINE FILE 2 (200,370,U,ID2)
C      DEFINE FILE 7 (20,370,U,ID7)
C      COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAP
C      1,      ANAME(20),PNAME(4,10),M1,D2,D3,D4,D7,ID2,ID3,ID4,ID7
C      2,      D8,ID8
C      INTEGER FYEAR,FMONTH,YEAR,D2,D3,D4,D7,D8
C      COMMON /Y/ Q(370), DUM1(370,4), DUM2(380,6)
C
C      BLAG=1.-TLAG
C      Q(1)=-999.
C
C
C      SETTING RELATIVE RECORD NUMBER FOR
C      OBSERVED DISCHARGE IN DATA SET D2 AND D7
C
C      ID2=1
C      ID7=1
C
C      LYR=FYEAR+NYEAR-1
C      DO 300 YEAR=FYEAR,LYR
C
C      READING OBSERVED DISCHARGE FOR ONE YEAR
C      FROM DATA SET D2
C
C      READ (D2,ID2) (Q(J),J=2,367)
C      JS=1
C      IF (YEAR.EQ.FYEAR) JS=2
C
C      LEAP YEAR CONSIDERATION
C
C      IYR=YEAR
C      IF (FMONTH .GT. 2) IYR=IYR+1
C      JE=365
C      IF (MOD(IYR, 4).EQ.0) JE=366
C
C      GETTING MODIFIED DISCHARGE FOR
C      ONE YEAR
C
C      DO 120 J=JS,JE

```

```
120 Q(J)=Q(J)*BLAG+Q(J+1)*ATLAG
```

```
WRITING MODIFIED DISCHARGE TO  
DATA SET D7
```

```
WRITE (D7>ID7) (Q(J),J=1,367)
```

```
SHIFTING DISCHARGE OF LAST DAY TO  
FIRST DAY DISCHARGE OF NEXT YEAR
```

```
Q(1)=Q(JE+1)
```

```
300 CONTINUE  
RETURN  
END
```

```
SUBROUTINE FOR CLASIFYING SUBPERIODS  
USING ESTIMATED DISCHARGE
```

```
SUBROUTINE CLSFY (CC, Q0)
```

```
DEFINE FILE 3 (100,370,U,ID3)
```

```
COMMON // FYEAR, FMONTH, LYEAR, LMONTH, NYEAR, NF, ISNOW, IEVAP  
1, ANAME(20), PNAME(4,10), MT, D2, D3, D4, D7, ID2, ID3, ID4, ID7  
2, D8, ID8  
INTEGER FYEAR, FMONTH, YEAR, D2, D3, D4, D7, D8  
COMMON /Y/ QEI(380,5), QE(380), ISF(370), DUMMY(370,4)
```

```
ISP(1)=0  
QE(1)=-999.
```

```
INITIALIZING RELATIVE RECORD NUMBER  
IN DATA SET D3
```

```
IR=1  
JR=1
```

```
LYR=FYEAR+NYEAR-1  
DO 300 YEAR=FYEAR,LYR
```

```
READING CALCULATED DISCHARGE FROM  
EACH PIPES AND QE
```

```
READ (D3'IR) (QE(J),J=2,367)  
IR=IR+1  
DO 100 I=1,5  
READ (D3'IR) (QEI(J,I),J=2,367)  
100 IR=IR+1  
IR=IR+ISNOW
```

```
JS=2  
JE=366
```

```
LEAP YEAR CONSIDERATION
```

```
IYR=YEAR  
IF (FMONTH .GT. 2) IYR=IYR+1  
IF (MOD(IYR, 4).EQ.0) JE=367
```

```
CALCULATION FOR ONE YEAR
```


LEAF YEAR CONSIDERATION

IYR=YEAR
 IF (FMONTH .GT. 2) IYR=IYR+1
 IF (MOD(IYR, 4).EQ.0) JE=367
 IF (YEAR .EQ. FYEAR) JS=4
 IF (YEAR .LT. LYR) GO TO 410
 JE=JE+1
 Q(JE+1) = -999.
 QLOG(JE+1) = -999.
 410 CONTINUE

CALCULATION FOR ONE YEAR

DO 480 J=JS,JE
 IF (Q(J) .LT. 0.) GO TO 480

MINIMUM QUANTITY AMONG THREE ADJOINING
 (QE - Q) IS SELECTED FOR MSEQ

$DQ0 = (QE(J) - Q(J-1)) ** 2$
 $DQ1 = (QE(J) - Q(J)) ** 2$
 $DQ2 = (QE(J) - Q(J+1)) ** 2$
 $DQ = \text{AMIN1}(DQ0, DQ1, DQ2)$
 $MSEQ = MSEQ + DQ$

MINIMUM QUANTITY AMONG THREE ADJOINING
 (ALOG(QE) - ALOG(Q)) IS SELECTED
 FOR MSELQ

$DQ0 = (QELOG(J) - QLOG(J-1)) ** 2$
 $DQ1 = (QELOG(J) - QLOG(J)) ** 2$
 $DQ2 = (QELOG(J) - QLOG(J+1)) ** 2$
 $DQ = \text{AMIN1}(DQ0, DQ1, DQ2)$
 $MSELQ = MSELQ + DQ$

GETTING SUM OF Q(J) AND NUMBER OF DAY
 SUMMED UP

IDAY=IDAY+1
 SQ0 = SQ0 + Q(J)

GETTING SUBPERIOD NUMBER FOR TARGET DAY
 AND SETTING IT TO I

I = IABS (ISP(J))

VALUE OF TARGET DAY IS NEGLECTED,
 IF SUBPERIOD NUMBER IS EQUAL TO ZERO.

IF (I .EQ. 0) GO TO 480

IF SUBPERIOD NUMBER IS LESS THAN -2,
 SUBPERIOD NUMBER OF NEXT DAY IS SET TO I
 INSTEAD OF ONE OF THIS DAY

IF (ISP(J) .LE. -3) I = IABS(ISP(J+1))

SUMS OF Q, QE FOR EACH SUBPERIODS ARE
 CALCULATED




```

C
DO 510 I=2,4
IF (IRDFB(I) .EQ. 1) GO TO 510
IF (ND(I).EQ.0) GO TO 510
RD(I)=DLQE(I)/DLQ(I)
RD(I)=(1.+RD(I))*0.5
510 CONTINUE

C
C          GETTING RX = (ABS(RQ-1.) OR ABS(RD-1.)).
C          IF NUMBER OF DAY IN SUBPERIOD I IS LESS
C          THAN OR EQUAL NN=(NUMBER OF YEAR)*4,
C          CALCULATION OF RX
C
NN=NYEAR*4
DO 515 I=1,5
IF (NQ(I) .GT. NN) RX(I) = ABS(RQ(I) - 1.)
515 CONTINUE

C
DO 520 I=2,4
IF (ND(I) .GT. NN) RX(I+5) = ABS(RD(I) - 1.)
520 CONTINUE

C
C          CALCULATING MEAN SQUARE ROOT OF
C          DIFFERENCE OF QE AND Q (MSEQ) AND OF
C          DIFFERENCE OF ALOG(QE) AND ALOG(Q)
C          (MSELQ)
C
DAY=IDAY
MSEQ = SQRT(MSEQ+DAY)/SQO
MSELQ=SQRT(MSELQ/DAY)

C
C          CALCULATING CRITERION FOR BEST FIT
C
CR = (MSEQ + MSELQ) * 0.5

C
C          GETTING MAXIMUM AMONG RX AND SECOND
C          MAXIMUM AMONG RX
C
MAX1=1
DO 540 I=2,9
IF (RX(I).GT.RX(MAX1)) MAX1=I
540 CONTINUE
MAX2=1
IF (MAX1.EQ.1) MAX2=2
DO 550 I=2,9
IF (I.NE.MAX1.AND.RX(I).GT.RX(MAX2)) MAX2=I
550 CONTINUE
RETURN
END

C
C          SUBROUTINE FOR PARAMETER ADJUSTING
C
SUBROUTINE ADJUST (IERR, A0, A1, A2, B0, B1, C0, C1)
COMMON /CRIT/ R(10),MAX1,MAX2,NI(5),ND(5),IDAY,NN,
1     MSEQ,MSELQ,MSEDC,MSELDC,CRHY,CRDC

C
DIMENSION RQ(5),RD(5)
EQUIVALENCE (R(1),RQ(1)),(R(6),RD(1))

C
C          RQ(3), RQ(4) AND RQ(5) ARE STORED
C          IN ORDER TO USE AFTERWARD.

```

```

RQ3=RQ(3)
RQ4=RQ(4)
RQ5=RQ(5)
C
C           SETTING RQ AND RD TO 1 EXCEPT MAXIMUM
C           ONE AND SECOND MAXIMUM ONE
C
DO 700 I=1,10
IF (I.EQ.MAX1.OR.I.EQ.MAX2) GO TO 700
R(I)=1.
700 CONTINUE
C
C           IF R(I) IS GREATER THAN 2, SET R(I)=2
C           IF R(I) IS SMALLER THAN 0.5, SET R(I)=0.5
C
IF (R(MAX1).GT.2.) R(MAX1)=2.
IF (R(MAX1).LT.0.5) R(MAX1)=0.5
IF (R(MAX2).GT.2.) R(MAX2)=2.
IF (R(MAX2).LT.0.5) R(MAX2)=0.5
C
B=(A1/A0)/RQ(2)
A=(A2/A0)/RQ(1)
A0=(A0+A1+A2)/RD(2)/(1.+A+B)
A1=B*A0
A2=A*A0
C
IF ((RQ3-1.)*(RQ4-1.).GT.0.) GO TO 760
C
B=B1/B0/RQ(3)
B0=(B0+B1)/RD(3)/(1.+B)
B1=B0*B
GO TO 770
C
760 A0=A0/RQ(3)
B0=B0/RD(3)
B1=B1/RD(3)
C
770 IF (NI(5).EQ.NN) GO TO 780
C
IF ((RQ4-1.)*(RQ5-1.).GT.0.) GO TO 780
C
C=C1/C0/RQ(4)
C0=(C0+C1)/RD(4)/(1.+C)
C1=C0*C
C
A0=4.*A0/(3.+RQ(5))
B0=2.*B0/(1.+RQ(5))
C0=C0/RQ(5)
GO TO 790
780 A0.= 2.*A0/(1.+RQ(4))
A0 = B0/RQ(4)
C0 = C0/RD(4)
C1 = C1/RD(4)
C
790 IF (A0+A1+A2.GE.1. .OR. B0+B1.GE.1. OR. C0+C1.GE.1.) GO TO 800
C
IERR = 0
RETURN
800 WRITE (6,40)
WRITE (6,50) A2, A1, A0, B1, B0, C1, C0
40 FORMAT (//, ' **** SOMETHING IS WRONG **** ')
50 FORMAT (//, 9X, 'A2', F8.4, 4X, 'A1', F8.4, 4X, 'A0', F8.4,

```

```

1      4X,'B1',F8.4,4X,'B0',F8.4,4X,'C1',F8.4,4X,'C0',F8.4,/)
C
      IERR = 1
      RETURN
      END
C
      SUBROUTINE FOR WRITING INTERMEDIATE RESULT
C
      SUBROUTINE PRDHCR (NO, CR, DH, IDISK)
C
      DEFINE FILE 4(50,300,U,ID4)
C
      COMMON // FYEAR,FMONTH,LYEAR,LMONTH,NYEAR,NP,ISNOW,IEVAF
1,      ANAME(20),PNAME(4,10),MT,D2,D3,D4,D7,ID2,ID3,ID4,ID7
2,      DS,IDS
      INTEGER FYEAR,FMONTH,      D2,D3,D4,D7,DS
      COMMON /FRM/ S1,S2,HA1,HA2,A0,A1,A2,HB1,B0,B1,HC1,C0,C1
1,      HD1,D0,D1,LAC,E(12),CE(12),K1,K2,CP(10),WE(10),CM(12)
      REAL K1,K2
      COMMON /XIN/ XAIN(4,10),XSIN(4,10),XBIN(4,10),XCIN(4,10)
1,      XDIN(4,10)
      COMMON /CRIT/ RQ(5),RD(5),MAX1,MAX2,NI(5),ND(5),IDAY,NN,
1      MSEQ,MSELQ,MSEDC,MSELDC,CRHY,CRDC
      REAL RX(10),MSEQ,MSELQ,MSEDC,MSELDC
C
      DATA AST,BLK/'*', ' ' /
      DATA HY/'H' /
C
      WRITE (6,50) NO, A0, A1, A2, 'B0', B1, C0, C1, D0, D1
1,      S1, S2, HA1, HA2, HB1, HC1, HD1
C
      WRITE (6,52)
      DO 950 K=1,NP
      WRITE (6,53) (PNAME(I,K),I=1,2),(L, XAIN(L,K),XSIN(L,K)
1,      XBIN(L,K),XCIN(L,K),XDIN(L,K), L=1,4)
950 CONTINUE
C
      50 FORMAT (///, ' NO.', I2, 3X, 'A0', F8.4, 4X, 'A1', F8.4, 4X, 'A2', F8.4, 4X
1, 'B0', F8.4, 4X, 'B1', F8.4, 4X, 'C0', F8.4, 4X, 'C1', F8.4, 4X, 'D0'
2, F8.4, 4X, 'D1', F8.4, /, 9X, 'S1', F6.0, 6X, 'S2', F6.0, 6X, 'HA1', F5.0
3, 6X, 'HA2', F5.0, 6X, 'HB1', F5.0, 6X, 'HC1', F5.0, 6X, 'HD1', F5.0, /)
      52 FORMAT (28X, 2('KA', 6X, 'KB', 6X, 'XC', 6X, 'XD', 18X))
      53 FORMAT (9X, 2A4, 2X, 2('AR', I1, 5F8.0, 9X), /, 19X, 2('AR', I1, 5F8.0, 9X))
C
      DO 970 I=1,10
970 RX(I)=BLK
      RX(MAX1)=AST
      RX(MAX2)=AST
C
      IF (DH .EQ. HY) GO TO 980
C
      WRITE (6,54) (I,I=1,5)
      WRITE (6,55) (NI(I),I=1,5),MSEQ,MSELQ,CRHY
      WRITE (6,56) (RQ(I),RX(I),I=1,5),MSEDC,MSELDC,CRDC
      WRITE (6,57) (RD(I),RX(I+5),I=2,4),CR
C
      54 FORMAT(/, 8X, 5I11)
      55 FORMAT(9X, 'N', 18, 4I11, 13X, 'MSEQ', F8.4, 5X,
1 'MSELQ', F8.4, 5X, 'CRHY', F8.4)
      56 FORMAT(9X, 'RQ', 5(F10.4, A1), 10X, 'MSEDC', F8.4, 5X,
1 'MSELDC', F8.4, 5X, 'CRDC', F8.4)
      57 FORMAT(9X, 'RD', 7X, '-', 3X, 3(F10.4, A1), 7X, '-', 50X, 'CR', F10.4)

```

```

GO TO 990
C
980 WRITE (6,64) (1,I=1,5)
    WRITE (6,65) NI, IDAY
    WRITE (6,66) (ND(I), I=2,5), MSEQ
    WRITE (6,67) (RQ(I), RX(I), I=1,5), MSELQ
    WRITE (6,68) (RD(I), RX(I+5), I=2,4), CR
C
64 FORMAT(/,8X,5I12,10X,'N')
65 FORMAT(9X,'NQ',19,5I12)
66 FORMAT(9X,'ND',8X,'-',4I12,24X,'MSEQ',F10.4)
67 FORMAT(9X,'RQ',5(F11.4,A1),21X,'MSELQ',F9.4)
68 FORMAT(9X,'RD',8X,'-',3X,3(F11.4,A1),8X,'-',24X,'CR',F12.4)
C
990 CONTINUE
    IF (IDISK.EQ.0) RETURN.
C
    IR = NO
    WRITE (D4'IR) NO, A2, A1, A0, B1, B0, C1, C0, XAIN, XSIN, XBIN
1,      XCIN, XDIN, NI, ND, IDAY, RQ, RD, MAX1, MAX2
2,      MSEQ, MSELQ, MSED, MSELDC, CRHY, CRDC, CR
C
    RETURN
    END
C
C      SUBROUTINE FOR WRITING FINAL RESULT
C
C      SUBROUTINE GOAL (IR, DH, Q0)
C
C      DEFINE FILE 2 (200,370,U, ID2)
C      DEFINE FILE 3 (100,370,U, ID3)
C      DEFINE FILE 4 (50,300,U, ID4)
C      DEFINE FILE 8 (1600, 20, U, ID8)
C
COMMON // FYEAR, FMONTH, LYEAR, LMONTH, NYEAR, NF, ISNOW, IEVAP
1,      ANAME(20), FNAME(4,10), MT, D2, D3, D4, D7, ID2, ID3, ID4, ID7
2,      D8, ID8
    INTEGER FYEAR, FMONTH, YEAR, D2, D3, D4, D7, D8, SAVEX
COMMON /PRM/ S1, S2, HA1, HA2, A0, A1, A2, HB1, B0, B1, HC1, C0, C1
1,      HD1, D0, D1, LAG, E(12), CE(12), K1, K2, CP(10), WE(10), CM(12)
    REAL K1, K2
COMMON /Y/ QEI(380,5), Q(380), QE(370), ST(370), EVAP(370)
1,      DUMMY(370,2)
COMMON /X/ XA(4,10), XS(4,10), XB(4,10), XC(4,10), XD(4,10)
COMMON /XIN/ XAIN(4,10), XSIN(4,10), XBIN(4,10), XCIN(4,10)
1,      XDIN(4,10)
COMMON /CRIT/ RQ(5), RD(5), MAX1, MAX2, NI(5), ND(5), IDAY, NN,
1      MSEQ, MSELQ, MSED, MSELDC, CRHY, CRDC
    REAL MSEQ, MSELQ, MSED, MSELDC
    DIMENSION MONTH(12)
    REAL MQ(12,20), MQE(12,20), DQ(12,20)
    DIMENSION P(366,10)
    DATA MONTH/31,28,31,30,31,30,31,31,30,31,30,31/
C
    WRITE (6,29) ANAME
29 FORMAT('1ROYAL IRRIGATION DEPARTMENT, THAILAND'
1, 'T118, 'COMPUTER CENTER', /
2, '1X,20A4,T118, 'TANK MODEL V-2C')
C
C      READING VARIOUS RESULT HAVING
C      RELATIVE RECORD NUMBER WHICH IS EQUAL
C      TO REPEAT NUMBER, THAT IS, WHICH CORRESPONDS

```



```

C           MINIMUM CR
C
C           READ (D4'IR) NO,A2,A1,A0,B1,B0,C1,C0,XAIN,XSIN,XBIN
1,          XCIN,XDIN,NI,ND,IDAY,RQ,RD,MAX1,MAX2
2,          MSEQ,MSELQ,MSEDC,MSELDC,CRHY,CRDC,CR
C
C           WRITING AGAIN VARIOUS RESULT
C
C           IDISK=0
C           CALL PRDHCR (NO, CR, DH, IDISK)
C
C           CALCULATING AGAIN TANK MODEL
C
C           DO 1410 K=1,NP
C           DO 1400 L=1,4
C           XA(L,K) = XAIN(L,K)
C           XB(L,K) = XBIN(L,K)
C           XC(L,K) = XCIN(L,K)
C           XD(L,K) = XDIN(L,K)
C           XS(L,K) = XSIN(L,K)
1400 CONTINUE
1410 CONTINUE
C
C           IDISK=1
C           SAVEX=1
C           CALL TNK4X4 (IDISK, SAVEX)
C
C           CALL QELAG (LAG)
C
C           IDQ = 1
C           IDP = NYEAR + 1
C           ID3=1
C
C           DO 2000 NY = 1,NYEAR
C
C           READING QE, QEI (CALCULATED DISCHARGES FROM
C           EACH PIPES), Q, EVAP, F AND ST (SNOW DEPOSIT)
C
C           READ (D3'ID3) (QE(J),J=1,366)
C           DO 1500 I=1,5
C           READ (D3'ID3) (QEI(J,I),J=1,366)
1500 CONTINUE
C           READ (D2'IDQ) (Q(J),J=1,366)
C           IDQ = IDQ + 1
C
C           IF (IEVAP .EQ. 0) GO TO 1501
C           READ (D2,IDP) (EVAP(J),J=1,366)
C           IDP = IDP + 1
C
1501 DO 1502 K=1,NP
C           READ (D2'IDP) (F(J,K),J=1,366)
1502 IDP = IDP + 1
C
C           CALCULATION OF
C           QEI(1)+QEI(2)+QEI(3)+QEI(4)+QEI(5)
C           QEI(2)+QEI(3)+QEI(4)+QEI(5)
C           QEI(3)+QEI(4)+QEI(5)
C           QEI(4)+QEI(5)
C           QEI(5)
C
C           DO 1530 J=1,366
C           I=4

```

```

1520 QEI(J,1)=QEI(J,1)+QEI(J,I+1)
      I=I-1
      IF (I.GE.1) GO TO 1520
1530 CONTINUE

```

C
C
C

LEAF YEAR CONSIDERATION

```

YEAR=FYEAR+NY-1
IYR = YEAR
IF (FMONTH .GT. 2) IYR = IYR + 1
MONTH(2)=28
IF (MOD(IYR, 4).EQ.0) MONTH(2)=29
IRX = (YEAR-FYEAR)*NF*12
WRITE (6,29) ANAME
WRITE (6,60)

```

C
C
C

CALCULATION FOR MONTHLY MEAN

```

JE=0
DO 1640 M=1,12
MON = FMONTH + M - 1
IF (MON .GT. 12) MON = MON - 12
JS=JE+1
JE=JE+MONTH(MON)
SQ=0.
SQE=0.
DAY=0.
DO 1600 J=JS,JE
IF (Q(J)+Q0 .LT. 0. .OR. QE(J) .LT. 0.) GO TO 1600
SQ=SQ+Q(J)
SQE=SQE+QE(J)
DAY=DAY+1
1600 CONTINUE
MQ(M,NY)=0.
MQE(M,NY)=0.
DQ(M,NY)=-999.
IF (DAY.EQ.0.) GO TO 1610
MQ(M,NY)=SQ/DAY
MQE(M,NY)=SQE/DAY
DQ(M,NY)=0.
IF (SQ.EQ.0..OR.SQE.EQ.0.) GO TO 1610
DQ(M,NY)=ALOG(MQE(M,NY))-ALOG(MQ(M,NY))

```

C

```

1610 IYR = YEAR
      IF (M .EQ. 1) GO TO 1612
      IF (MON .EQ. 1) GO TO 1611
      WRITE (6,62) MON,SQ,SQE
      GO TO 1613
1611 IYR = YEAR + 1
1612 WRITE (6,61) IYR,MON,SQ,SQE
1613 DO 1630 K=1,NF
      IR = IRX + (K-1)*12 + M
      READ (D8'IR) (XA(L,K),XS(L,K),XB(L,K),XC(L,K),XD(L,K))
      1, L=1,4)
      DO 1622 L=1,4
      XP = S1
      XF = XA(L,K) - S1
      IF (XF .GT. 0.) GO TO 1620
      XF = 0.
      XP = XA(L,K)
1620 IF (L .GE. 2) GO TO 1621
      WRITE (6,63) (PNAME(1,K),I=1,2),L,XF,XP,XS(L,K),XB(L,K)

```



```

1,          XC(L,K),XD(L,K)
GO TO 1622
1621 WRITE (6,64) L,XF,XF,XS(L,K),XB(L,K),XC(L,K),XD(L,K)
1622 CONTINUE
1630 CONTINUE
60 FORMAT (/ ,15X,'Q',8X,'QE',23X,'XF',7X,'XP',7X,'XS',7X,'XB'
1,          7X,'XC',7X,'XD')
61 FORMAT (1H ,I4,I3,2F10.2)
62 FORMAT (5X,I3,2F10.2)
63 FORMAT (30X,2A4,2X,'AR',I1,6F9.0)
64 FORMAT (40X,'AR',I1,6F9.0)
IF (NY .EQ. NYEAR .AND. MON .EQ. LMONTH) GO TO 1630
1640 CONTINUE
1650 CONTINUE

```

C
C
C
C
GRAPH PLOTTING FOR DAILY DISCHARGE

```

MS = FMONTH
ME = FMONTH + 11
IF (ME .GT. 12) ME = ME - 12
IF (NY .EQ. NYEAR) ME = LMONTH
CALL HYDRGR (ISNOW, YEAR, MS, ME, Q, QE, QEI(1,1), QEI(1,3)
1,          QEI(1,4), ST, NP, P, IEVAP, EVAP, Q0)

```

C
C
C
C
2000 CONTINUE

C
C
C
C
GRAPH PLOTTING FOR MONTHLY DISCHARGE

```

CALL PLOTM (FYEAR, FMONTH, LYEAR, LMONTH, NYEAR, MQ, MQE, DQ, Q0)

RETURN
END

```

C
C
C
C
SUBROUTINE FOR GRAPH PLOTTING FOR DAILY DISCHARGE

```

SUBROUTINE HYDRGR (ISNOW, YEAR, MS, ME, Q, QA, QB, QC, QD
1,          ST, NP, P, IEVAP, E, Q0)
COMMON /HYGR/ NFLOT, NSCAL, LY, YMIN, YMAX, SCAL(5), GRFMT(10)
DIMENSION Q(366), QA(366), QB(366), QC(366), QD(366), ST(366)
1,          E(366), P(366, NP), IPREC(10)
DIMENSION MONTH(12), FMT(4)
DIMENSION GBUF(120), ISCAL(5), CM(12,3), CHAR(5), FLOT(5)
INTEGER YEAR
DATA MONTH /31,28,31,30,31,30,31,31,30,31,30,31/
DATA CM // 'J','F','M','A','M','J','J','A','S','O','N','D',
2          'A','E','A','P','A','U','U','U','E','C','O','E',
3          'N','B','R','R','Y','N','L','G','F','T','V','C'//
DATA CHAR /'O','*','B','C','D'//, CHAB, CHAI // ' ',' ',' ', CQM // '?'//
DATA CHAR /'*','+', ' ',' ',' ',' '-//
1,          CHAB, CHAI, CQM // ' ',' ', 'I', '?'//

```

C
C
C
C
C
C
C
C
C
SETTING MAXIMUM AND MINIMUM PLOTTING VALUE IN LOGARISMIC SCALE

```

AMIN=ALOG10(YMIN+Q0)
AMAX=ALOG10(YMAX+Q0)

```

C
C
C
C
C
SETTING VALUE FOR ONE CHARACTER SPACE

```

DY=IFIX(FLOAT(LY-1)/(AMAX-AMIN))

```

C
C
C
C
C
SETTING POSITIONS OF SCALE POINTS

```

C      DO 100 N=1,NSCAL
      ISCAL(N)=(ALOG10(SCAL(N)+QO)-AMIN)*DY+1.
      IF (ISCAL(N).LT. 1) ISCAL(N) = 1
      IF (ISCAL(N).GT.LY) ISCAL(N)=LY
100  CONTINUE
C
C          LEAP YEAR CONSIDERATION
C
      IYR = YEAR
      IF (MS .GT. 2) IYR=IYR+1
      MM = ME
      IF (ME .LT. MS) MM=ME+12
      MONTH(2)-29
      IF (MOD(IYR, 4).EQ.0) MONTH(2)-29
C
      JE=0
      DO 300 MON=MS,MM
C
C          CONSIDERATION WHEN FMONTH IS NOT EQUAL 1
C
      M = MON
      IF (M .GT. 12) M = M - 12
      IF (MOD(MON-MS,2) .EQ. 0) WRITE (6,60)
      IF (M .NE. 1) GO TO 109
      IYR = YEAR
      IF (MS .GT. 1) IYR = IYR + 1
      WRITE (6,61) IYR
60  FORMAT (1H1, I4)
61  FORMAT (1H , I4)
109  CONTINUE
C
      JS=JE+1
      JE=JE+MONTH(M)
C
      DO 200 J=JS,JE
C
C          INITIALIZING GBUF TO BLANK
C
      DO 120 L=1,LY
120  GBUF(L)=CHAB
C
C          PREPARATION FOR PRINTING OF MONTH SYMBOL
C
      AM=CHAB
      JDAY=J-JS+1
      IF (JDAY.GT.3) GO TO 125
      IF (JDAY.GT.3) GO TO 140
      AM=CM(M,JDAY)
      IF (JDAY.NE.1) GO TO 140
C
C          PREPARATION FOR PRINTING OF SCALE POINTS
C
125  DO 130 N=1,NSCAL
      IF=ISCAL(N)
130  GBUF(IF)=CHAI
C
C          PREPARATION FOR PRINTING OF EACH GRAPH
C
140  PLOT(1)=Q(J)
      PLOT(2)=QA(J)
      PLOT(3)=QB(J)

```




```

REAL MQ(12,NY),MQE(12,NY),DQ(12,NY),PLOT(2)
INTEGER AM(12),GBUF(100),C(2),ISCAL(8)
INTEGER CHAA,CHAB,CHAC
DATA CHAA,CHAB,CHAC/' ', 'D' /
C DATA CHAA,CHAB,CHAC/' ', 'D' /
DATA ISCAL/1,21,41,0,0,0,0,0/
DATA LE, LO, LYMQ, BYDQ /100, 41, 60, 20./
DATA C/'*', '0' /
C DATA C/'+', '*' /
DATA AM/'JAN','FEB','MAR','APR','MAY','JUN',
1 'JUL','AUG','SEP','OCT','NOV','DEC' /
DATA LP/6/

C          SETTING MAXIMUM AND MINIMUM PLOTTING VALUE
C          IN LOGARISMIC SCALE

AMIN=ALOG10(YMIN+QO)
AMAX=ALOG10(YMAX+QO)

C          SETTING VALUE FOR ONE CHARACTER SPACE

DYMQ = IFIX(FLOAT(LYMQ-1)/(AMAX-AMIN))

C          SETTING POSITIONS OF SCALE POINTS

DO 100 K=1,NSCAL
KK=K+3
ISCAL(KK) = (ALOG10(SCAL(K)+QO)-AMIN)*DYMQ + FLOAT(LO)
IF (ISCAL(KK).GT.LE) ISCAL(KK)=LE
IF (ISCAL(KK).LT.LO) ISCAL(KK)=LO
100 CONTINUE
KSCAL=NSCAL+3

C          SSMQ = 0.
C          SSMQE = 0.

DO 300 N=1,NY
C          SMQ = 0.
C          SMQE = 0.
YEAR=FYEAR+N-1
IF (FMONTH .GT. 1) YEAR=YEAR+1

C          IF (MOD(N,4).EQ.1) WRITE (LP,10)
10 FORMAT (1H1,/,13X,'MQ',5X,'MQE',4X,'DQ',/)
C          DO 200 M=1,12
C          CONSIDERATION WHEN FMONTH IS NOT EQUAL 1
C          MON = M + FMONTH - 1
C          IF (MON .GT. 12) MON = MON - 12

C          INITIALIZING GBUF TO BLANK

DO 110 L=1,LE
110 GBUF(L)=CHAB

C          IF (M .NE. 1) GO TO 140

C          PREPARATION FOR PRINTING OF SCALE POINTS

```

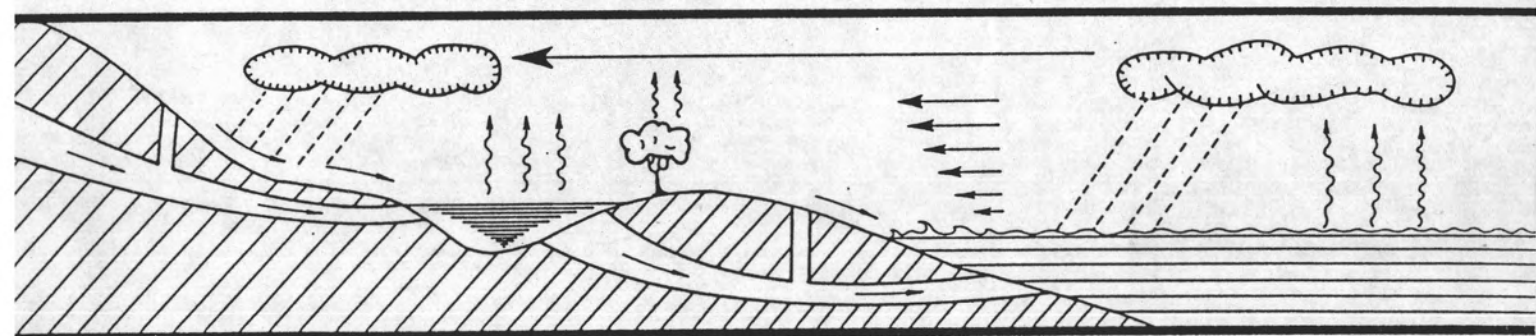
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DO 120 K=1,KSCAL
  IP=ISCAL(K)
120 GBUF(IP)=CHAA
C
C          PREPARATION FOR PRINTING OF EACH GRAPH,
C          AND SETTING PRINT POSITION IF FOR GRAPH
C          OF DQ, AND SETTING APPROPRIATE CHARACTER
C          IN IF POSITION OF GBUF
C
140 IF (DQ(M,N).EQ. 999.) GO TO 180
    SMQ = SMQ + MQ (M,N)
    SMQE = SMQE + MQE(M,N)
    IP=(DQ(M,N)+1.)*DYDQ+1.
    IF (IP.LT.1) IF=1
    IF (IP.GT.LO) IF=LO
    GBUF(IP)=CHAC
    PLOT(1)=MQE(M,N)
    PLOT(2)=MQ(M,N)
C
C          SETTING PRINT POSITION (IF) FOR MQ AND MQE,
C          AND SETTING APPROPRIATE CHARACTER IN IF
C          POSITION OF GBUF
C
DO 170 NX=1,2
  IF (PLOT(NX).GT.YMIN) GO TO 150
  IF=LO
  GO TO 160
150 IP = (ALOG10(PLOT(NX)+QO)-AMIN)*ADYMQ + FLOAT(LO)
  IF (IP.LT.LO) IF=LO
  IF (IP.GT.LE) IF=LE
160 GBUF(IP)=C(NX)
170 CONTINUE
C
  WRITE (LP,30) AM(MON),MQ(M,N),MQE(M,N),DQ(M,N),(GBUF(L),L=1,LE)
  GO TO 190
30 FORMAT (6X,A3,3F7.2,100A1)
C
180 WRITE (LP,31) AM(MON),(GBUF(L),L=1,LE)
31 FORMAT(6X,A3,' * * * ',100A1)
C
190 CONTINUE
  IF (MON .GT. 1) GO TO 200
  WRITE (LP,20) YEAR
20 FORMAT (1H+,14)
C
  IF (N .EQ. NY .AND. MON .EQ. LMONTH) GO TO 210
200 CONTINUE
C
210 WRITE (LP,40) SSMQ,SSMQE
40 FORMAT (5X,'YEAR',2F7.2,/)
C
  SSMQ = SSMQ + SMQ
  SSMQE = SSMQE + SMQE
300 CONTINUE
C
  WRITE (LP,41) SSMQ,SSMQE
41 FORMAT (1H0,3X,'TOTAL',2F7.2)
C
  RETURN
  END

```

ภาคผนวก ข

TANK MODEL VERSION 1




```

C-----
C      TANK MODEL PROGRAM (VERSION 1)
C
C      ORIGINAL * M.SUGAWARA, E.OZAKI, I.WATANABE, Y.KATSUYAMA
C      "TANK MODEL NAD IT'S APPLICATION TO BIRD CREEK,
C      WOLLOMBI BROOK, BIKIN RIVER, KITSU RIVER, SANAGA RIVER,
C      AND NAM MUNE", NAYIONAL RESEARCH CENTER FOR DISASTER
C      PREVENTION, RESEARCH NOTE NO. 11, TOKYO, JUNE 1974
C
C      WATER YEAR VERSION MODIFIED BY
C      *SUPOT PROMNARET* APRIL 1981
C
C      APPLE II CP/M-80 FORTRAN VERSION MODIFIED BY
C      *WERACHAI CHUPISANYAROTE* JANUARY 1984
C
C      DATA INPUT BY MBASIC PROGRAM NAMLY D-TANK
C-----
C
C      DIMENSION Q(366),P(366),E(12),QE(371),SCAL(6),PK(366),
1      R(4),FMONTH(12),ID1M(12),GBUF(101)
C      COMMON AO,BO,CO,DO,A1,HA1(4),A2,HA2(4),A3,HA3(4),HB,B1,HC,C1,
2      HD,D1,S(4),PS(4),SS(4),HS(4),PP(13),PB(12),PA,EA,EB,TB,
3      TBO,TC,TCO,SCH,XCH,CH1,CH2,H,A,XO,IC3,QNAME(20)
4      ,XA(4),XS(4),XB(4),XC(4),XD(4),QMAX,LAG,NZ,IYEARE,DAA
C
C
C      1000 BLOCK 1
C      SET CONSTANT
C      DATA ID1M/31,28,31,30,31,30,31,31,30,31,30,31/
C      DATA FMONTH/'JAN','FEB','MAR','APR','MAY','JUN',
2      'JUL','AUG','SEP','OCT','NOV','DEC'/
C      DATA GO,G1,G2,G3/' ',':','+', '*'/
C
C      CONSOLE
C      ICON=1
C
C      DISKET
C      IDS1=6
C      IDS2=7
C      IDS3=8
C      IDS4=9
C
C      PRINTER
C      IPR=2
C
C      PLOT "TANK"
C      WRITE (ICON,100)
100  FORMAT (' ',//,
2      ' TANK MODEL (VERSION 1)',/,
3      ' ORIGINAL M.SUGAWARA',/,
4      ' CP/M 80 W.CHUPISANYAROTE',/,
5      //)
C
C      READ CONSTANT IN COMMON BLOCK
C      CALL PMF
C      WRITE (ICON,200)

```

```

200  FORMAT ('          INSERT DATADISK')
      PAUSE
C
C
C  PREPARATION FOR PLOTTING HYDROGRAPH
      QMAX=QMAX*86.4/DAA
1100  SCALE=ALOG10(QMAX)-5.0
      IF (SCALE .LT. 0.) SCALE=SCALE-1.
      ISCALE = SCALE
      SCALE = ISCALE
      SCALE=10.**SCALE
      DO 1200 I1=1,6
      F11=I1
      SCAL(I1)=SCALE*(10**(F11-1.))
1200  CONTINUE
C
C  RATIO OF ADJACENT ZONE
      R(1)=0.
      IF (NZ .EQ. 1) GOTO 1300
C  ELSE
      DO 1400 I=2,NZ
1400  R(I)=S(I-1)/S(I)
C  THEN
1300  CONTINUE
C
C  MULTIPLYING COEFFICIENT FOR P
C
      READ (IDS4,1510) NP
1510  FORMAT (12)
      SPP=0.
      DO 1500 K=1,NP
1500  SPP=SPP+PP(K)
      DO 1600 K=1,NP
1600  PP(K)=PP(K)/SPP
      DO 1700 M=1,12
1700  PB(M)=PB(M)*PA
C
C  CLEAR CONTENT OF ADDRESSES FOR TIME LAG
C
      DO 1800 J=366,370
1800  QE(J)=0.
      JLAG=366
C
C  END OF BLOCK 1
C
C
C  ENTRY OF COMPUTING LOOP FOR ONE YEAR
C
C  2000 BLOCK 2
C  READ Q, E, P OF ONE YEAR
C
C  READ WATER YEAR RECORD
C
2000  READ(IDS2,2010)IYEAR1
2010  FORMAT (14)
      IYEAR2=IYEAR1+1
      IF(MOD(IYEAR2,4).EQ.0.) GOTO 2200
C  ELSE
      ID1M(2)=28
      ID1Y=365

```

```

GOTO 2300
C THEN
2200 ID1M(2)=29
      ID1Y=366
C END IF
2300 DO 2100 J=1,366
      Q(1)=0.
      E(J)=0.
2100 P(J)=0.
C
C
C READ IDS2 RECORD (DISCHARGE)
DO 2400 I=1, ID1Y
2400 READ (IDS2,2410) Q(I)
2410 FORMAT (F10.3)
DO 2420 I=1, ID1Y
      Q(I)=Q(I)*86.4/DAA
2420 CONTINUE
C
C READ IDS3 RECORDS (EVAPORATION)
READ (IDS3,2502) IYEAR9
2502 FORMAT (I4)
DO 2500 I=1,12
2500 READ (IDS3,2510) E(I)
2510 FORMAT (F10.3)
C
C READ IDS4 RECORDS (PRECIPITATION)
DO 2600 K=1,NP
READ (IDS4,2652) IYEAR9
2652 FORMAT (I4)
DO 2650 I=1, ID1Y
      READ (IDS4,2610) PK(I)
2650 CONTINUE
2610 FORMAT (F10.3)
DO 2660 I=1, ID1Y
      P(I)=P(I)+PK(I)*PP(K)
2660 CONTINUE
2600 CONTINUE
C
C . END OF BLOCK 2
C
C 3000 BLOCK 3
C CALCULATION
C
C TRANSFER SOME VARIABLES FROM LAST YEAR END TO THE HEAD
C OF THIS YEAR (EFFECTED OF TIME LAG)
C WRITE (IPR,3010) QNAME,IYEAR1
C
3010 FORMAT (2X20A4,/2X15,'
2          XS          XB          XC          XD          XF          XP
          XCH')
C
DO 3100 J=1,5
QE(J)=QE(JLAG)
JLAG=JLAG+1
3100 CONTINUE
      JLAG=ID1Y+1
C
C CALCULATION FOR ONE YEAR
C
IDAY=0

```



```

DO 3200 IM1=4,15
IM2=IM1
IF (IM2 .GT. 12) IM2=IM2-12
IMO=IM1-3
SQ=0.
SQE=0.
C
C   CALCULATION FOR ONE MONTH
C
3110 WRITE (ICON,3110)FMONTH(IM2)
      FORMAT ('          ',A4)
      ID2=ID1M(IM2)
      DO 3300 ID=1, ID2
      IDAY=IDAY+1
      YA=0.
      Y1=0.
      YB=0.
      YC=0.
      YD=0.
C
C   MULTIPLE COEFFICIENT TO P
C
      PJ=P(IDAY)*PB(IM2)
C
C   MAINPART OF CALCULATION
C
      DO 3400 I=1,NZ
C
C   EVT AND TRANSFER TO CONFINED WATER
C
      CALL SUBA (E(IMO),EA,EB,PS(I),SS(I),XA(I),XS(I),XB(I),XC(I),
> XD(I),TB,TBO,TC,TCO)
C
C   INPUT TO THE TOP TANK OF I-TH ZONE
C   Y1*R(I)   INPUT FROM (I-1)-TH ZONE
C
      PI=PJ+(Y1*R(I))
C
C   CALCULATION OF TOP TANK
C
      CALL SUBB (PI,XA(I),Y2,Y1,YO,HS(I),PS(I),HA1(I),HA2(I),
> HA3(I),AO,A1,A2,A3)
C
      YA=YA+Y2*S(I)
C
C   CALCULATION OF 2-ND, 3-RD, 4-TH TANK
C
      YO=YO+YB*R(I)
      CALL SUBC (YO,XB(I),YB,YO,HB,BO,B1)
      YO=YO+YC*R(I)
      CALL SUBC (YO,XC(I),YC,YO,HC,CO,C1)
      YO=YO+YD*R(I)
      CALL SUBC (YO,XD(I),YD,YO,HD,DO,D1)
3400 CONTINUE

```



```

C
C   OUTPUT FROM THE TANK MODEL
C
YA=YA+Y1*S(NZ)
YB=YB*S(NZ)
YC=YC*S(NZ)
YD=YD*S(NZ)

C
C   ESTIMATED Q COMPONENT WITH TIME LAG
C
JL=IDAY+LAG
QD=YD
QC=YD+YC
QB=YD+YC+YB
QA=YD+YC+YB+YA

C
C   DEFORMATION BY RIVER CHANEL
C
QCH=QA+(PJ-E(1M1))*SCH
IF(1C3.EQ.0) CALL SUBD (QCH,QE(JL),XCH,H,CH1,CH2)
IF(1C3.NE.0) CALL SUBE (QCH,QE(JL),XCH,H,A,XO)

C
C   MONTHLY TOTAL OF Q
C
SQ=SQ+Q(IDAY)
SQE=SQE+QE(IDAY)
3300 CONTINUE

C
C   PRINT MONTHLY TOTAL OF Q, MONTHLY END-VALUE OF
C   STORAGE OF EVERY TANK
C
WRITE(IPR,3520) FMONTH(1M2),SQ,SQE
3520 FORMAT (2X,A4,2F10.3)

C
DO 3600 I=1,NZ
XP=PS(I)
XF=XA(I)-PS(I)
IF (XF.GE.0.) GOTO 3610
C
ELSE
XF=0.
XP=XA(I)
3610 IF (I.NE.1) GOTO 3620
C
ELSE
WRITE (IPR,3630) I,XF,XP,XS(1),XB(1),XC(1),XD(1),XCH
GOTO 3600
3620 WRITE(IPR,3630) I,XF,XP,XS(1),XB(1),XC(1),XD(1)
C
END IF
C
END IF
3630 FORMAT (30X,'S',11,7F10.4)
3600 CONTINUE
C
3200 CONTINUE
C
END OF BLOCK 3
C
C
C
C
C

```

```

C      BLOCK 4 OUTPUT
C
C      HYDROGRAPH PLOTTING, SEMILOGARITHMIC FORM
C
C      GBUF(L)   BUFFER FOR ONE LINE FOR GRAPH PLOTTING
C      SCAL(N)   SCALE POINT ON COORDINATE (N=1,...NSCA)
C
4010  WRITE (IPR,4010)SCAL(1),SCAL(2),SCAL(3),SCAL(4),SCAL(5),SCAL(6)
      FORMAT (///'          P      E      Q      QE',F6.3,5F20.3, /
2 30X, '-----', /
3      '-----', /)
C
      IDAY=0
      DO 4400 IM1=4,15
      IM2=IM1
      IF (IM2 .GT. 12) IM2=IM2-12
C
      ID2=ID1M(IM2)
      DO 4400 ID1=1, ID2
      IDAY=IDAY+1
      FMN=GO
      IF (ID1 .EQ. 1) FMN=FMONTH(IM2)
      IF ( Q(IDAY) .GT. SCAL(1) ) GOTO 4110
      IPQ=1
      GOTO 4120
4110  IPQ=20*(ALOG10(Q(IDAY)/SCAL(1)))+1.5
4120  IF ( QE(IDAY) .GT. SCAL(1) ) GOTO 4130
      IPQE=1
      GOTO 4140
4130  IPQE=20*(ALOG10(QE(IDAY)/SCAL(1)))+1.5
4140  IF (IPQ .GT. 101) IPQ=101
      IF (IPQE .GT. 101) IPQE=101
      DO 4500 L=1,101
4500  GBUF(L)=GO
      GBUF(1)=G1
      GBUF(21)=G1
      GBUF(41)=G1
      GBUF(61)=G1
      GBUF(81)=G1
      GBUF(101)=G1
      GBUF(IPQ)=G2
      GBUF(IPQE)=G3
C
      WRITE(IPR,4510) FMN,P(IDAY),E(IMO),Q(IDAY),QE(IDAY),
2      GBUF
4510  FORMAT(1X,A4,2F5.1,2F7.3,1X,101A1)
4400  CONTINUE
C
      WRITE (IPR,4610)
4610  FORMAT (30X, '-----', /
2,      '-----', /)
C
C      END OF BLOCK 4
C
C      5000 BLOCK 5
C      END
C
      IF(IYEAR1.LT.IYEARE) GOTO 2000
      STOP

```

```

      END
C
C   END OF BLOCK 5
C
C   END OF MAIN PROGRAM
C
C
C   SUBROUTINE SUBA (EVT,EA,EB,PS,SS,XA,XS,XB,XC,XD,TB,TBO,TC,TCO)
C
C-----EVT AND TRANSFER TO CONFINED WATER
C
C-----EVT FROM FREE WATER OF TOP TANK
C
      E=EVT*EA
C
C-----IF NO FREE WATER IN TOP TANK
      IF (XA .LE. PS) GOTO 110
      X=XA-PS-E
C
C-----IF FREE WATER IN THE TOP TANK IS NOT SUFFICIENT FOR EVT
      IF (X .LT. 0.) GOTO 100
      XA=X+PS
      GOTO 150
C
100   XA=PS
      E=-X
C
C-----EVT FROM CONFINED WATER
110   E=E*EB/EA
      XA=XA-E
      IF (XA .GE. 0.) GOTO 120
      E=-XA
      XA=0.
      XS=XS-E
      IF (XS .LT. 0.) XS=0.
120   CONTINUE
C
C-----TRANSFER TO PRIMARY SOIL MOISTURE FROM LOWER FREE WATER
      T1=TB*(1.-XA/PS)+TBO
      XA=XA+T1
      XB=XB-T1
      IF (XB .GE. 0.) GOTO 150
      XC=XC+XB
      XB=0.
      IF (XC .GE. 0.) GOTO 150
      XD=XD+XC
      XC=0.
      IF (XD .GE. 0.) GOTO 150
      XA=XA+XD
      XD=0.
150   CONTINUE
C
C-----TRANSFER TO SECONDARY S.M. FROM PRIMARY S.M.
      X=SS-XS
      IF (X .EQ. 0.) GOTO 200
      T2=TC*(1.-XS/SS)+TCO
      IF (T2 .GT. X) T2=X
      IF (T2 .GT. XA) T2=XA
      XA=XA-T2

```



```

XS=XS+T2
200 RETURN
C
END
C
C
SUBROUTINE SUBB (P,XA,Y2,Y1,YO,HS,PS,HA1,HA2,HA3,AO,A1,A2,A3)
C
C-----CALCULATION OF TOP TANK
XA=XA+P
Y2=0.
Y1=0.
YO=0.
IF (XA .LE. PS) GOTO 110
XF=XA-PS
IF (XF .LE. HA1) GOTO 100
Y1=(XF-HA1)*A1
IF (XF .LE. HA2) GOTO 100
Y2=(XF-HA2)*A2
IF (XF .LE. HA3) GOTO 100
Y2=Y2+(XF-HA3)*A3
100 IF (XF .GT. HS) XF=HS
YO=XF*AO
XA=XA-YO-Y1-Y2
110 RETURN
C
END
C
C
SUBROUTINE SUBC (P,XB,Y1,YO,HB,BO,B1)
C
C-----CALCULATION OF 2ND, 3RD, 4TH TANK
XB=XB+P
Y1=0.
IF (XB .GT. HB) Y1=(XB-HB)*B1
YO=XB*BO
XB=XB-Y1-YO
RETURN
C
END
C
C
SUBROUTINE SUBD (QCH,Y,XCH,H,CH1,CH2)
C
C-----DEFORMATION IN RIVER CHANNEL (TYPE-A)
XCH=XCH+QCH
IF (XCH .GT. 0.) GOTO 100
XCH=0.
Y=0.
GOTO 120
100 Y=XCH*CH1
IF (XCH .GT. H) Y=Y+(XCH-H)*CH2
XCH=XCH-Y
120 RETURN
C
END
C
C
TYPE-B
SUBROUTINE SUBE (QCH,Y,XCH,H,A,XO)
C

```



```

XCH=XCH+QCH
Y=0.
IF (XCH .GT. 0.) GOTO 100
XCH=0.
GOTO 150
100 IF (XCH .LT. H) GOTO 150
XF=XCH-H
IF (XF .GE. XO) GOTO 110
Y=A*XF*XF
GOTO 120
110 Y=0.8*XF-A*XO*XO
120 XCH=XCH-Y
150 RETURN
C
END
C
C
C READ DATA IN COMMON BLOCK
C
SUBROUTINE PMF
C
COMMON AO,BO,CO,DO,A1,HA1(4),A2,HA2(4),A3,HA3(4),HB,B1,HC,C1,
2 HD,D1,S(4),PS(4),SS(4),HS(4),PP(13),PB(12),PA,EA,EB,TB,
3 TBO,TC,TCO,SCH,XCH,CH1,CH2,H,A,XO,IC3,QNAME(20),
4 XA(4),XS(4),XB(4),XC(4),XD(4),QMAX,LAG,NZ,IYEARE,DAA
C
ICON=1
IDS1=6
IPR=2
C
READ (IDS1,11) QNAME
11 FORMAT(20A4)
READ (IDS1,10) AO,BO,CO,DO
READ (IDS1,10) A1,HA1
READ (IDS1,10) A2,HA2
READ (IDS1,10) A3,HA3
READ (IDS1,10) HB,B1,HC,C1,HD,D1
WRITE (1,50) HB,B1,HC
READ (IDS1,10) S,DAA
WRITE (1,50) DAA
READ (IDS1,10) PS,SS,HS
2 READ (IDS1,10) PP(1),PP(2),PP(3),PP(4),PP(5),PP(6),
PP(7),PP(8),PP(9),PP(10),PP(11),PP(12)
READ (IDS1,10) PP(13)
READ (IDS1,10) PB
READ (IDS1,10) PA
READ (IDS1,10) EA,EB,TB,TBO,TC,TCO,SCH,XCH
READ (IDS1,10) CH1,CH2,H,A,XO
READ (IDS1,10) XA,XS
READ (IDS1,10) XB,XC,XD
WRITE (1,50) XB,XC,XD
READ (IDS1,10) QMAX
WRITE (1,60) QMAX
READ (IDS1,15) LAG,IYEAR,IC3,NZ
WRITE (1,70)
C
10 FORMAT (8X,12G6.0)
15 FORMAT (8X,3I6,12)
C
C

```

```

C
WRITE (1PR,19) QNAME
WRITE (1PR,21)
WRITE (1PR,20) AO,BO,CO,DO
WRITE (1PR,22)
WRITE (1PR,20) A1,HA1
WRITE (1PR,23)
WRITE (1PR,20) A2,HA2
WRITE (1PR,24)
WRITE (1PR,20) A3,HA3
WRITE (1PR,25)
WRITE (1PR,20) HB,B1,HC,C1,HD,D1
WRITE (1PR,26)
WRITE (1PR,20) S,DAA
WRITE (1PR,27)
WRITE (1PR,20) PS,SS,HS
WRITE (1PR,28)
WRITE (1PR,20) PP(1),PP(2),PP(3),PP(4),PP(5),PP(6),
2 PP(7),PP(8),PP(9),PP(10),PP(11),PP(12)
WRITE (1PR,29)
WRITE (1PR,20) PP(13)
WRITE (1PR,30)
WRITE (1PR,20) PB
WRITE (1PR,31)
WRITE (1PR,20) PA
WRITE (1PR,32)
WRITE (1PR,20) EA,EB,TB,TBO,TC,TCO,SCH,XCH
WRITE (1PR,33)
WRITE (1PR,20) CH1,CH2,H,A,XO
WRITE (1PR,34)
WRITE (1PR,20) XA,XS
WRITE (1PR,35)
WRITE (1PR,20) XB,XC,XD
WRITE (1PR,36)
WRITE (1PR,20) QMAX
WRITE (1PR,37)
WRITE (1PR,41) LAG,1YEARE,IC3,NZ
19 FORMAT (20A4)
20 FORMAT (12F11.4)
21 FORMAT (/6X'(1)AO',6X'(2)BO',6X'(3)CO',6X'(4)DO')
22 FORMAT (/6X'(5)A1',5X'(6)HA1',8X'(7)',8X'(8)',8X'(9)')
23 FORMAT (/5X'(10)A2',4X'(11)HA2',7X'(12)',7X'(13)',7X'(14)')
24 FORMAT (/5X'(15)A3',4X'(16)HA3',7X'(17)',7X'(18)',7X'(19)')
25 FORMAT (/5X'(20)HB',5X'(21)B1',5X'(22)HC',5X'(23)C1'
2 5X'(24)HD',5X'(25)D1')
26 FORMAT (/6X'(26)S',7X'(27)',7X'(28)',7X'(29)',7X'DAA')
27 FORMAT (/5X'(30)PS',7X'(31)',7X'(32)',7X'(33)'
2 5X'(34)SS',7X'(35)',7X'(36)',7X'(37)'
3 5X'(38)HS',7X'(39)',7X'(40)',7X'(41)')
28 FORMAT (/5X'(42)PP',7X'(43)',7X'(44)',7X'(45)',7X'(46)',7X'(47)',
2 7X'(48)',7X'(49)',7X'(50)',7X'(51)',7X'(52)',7X'(53)')
29 FORMAT (/5X'(54)PP')
30 FORMAT (/5X'(55)PB',7X'(56)',7X'(57)',7X'(58)',7X'(59)',7X'(60)',
2 7X'(61)',7X'(62)',7X'(63)',7X'(64)',7X'(65)',7X'(66)')
31 FORMAT (/5X'(67)PA')
32 FORMAT (/5X'(68)EA',5X'(69)EB',5X'(70)TB',4X'(71)TBO',
2 5X'(72)TC',4X'(73)TCO',4X'(74)SCH',4X'(75)XCH')
33 FORMAT (/4X'(76)CH1',4X'(77)CH2',6X'(78)H',6X'(79)A',
2 5X'(80)XO')
34 FORMAT (/5X'(82)XA',7X'(83)',7X'(84)',7X'(85)',

```

```
      2      5X'(86)XS',7X'(87)',7X'(88)',7X'(89)')
35  FORMAT (/5X'(90)XB',7X'(91)',7X'(92)',7X'(93)')
      2      5X'(94)XC',7X'(95)',7X'(96)',7X'(97)')
      3      5X'(98)XD',7X'(99)',6X'(100)',6X'(101)')
36  FORMAT (/8X'(102)QMAX')
37  FORMAT (/5X'(103)LAG',5X'(104)IYEARE',5X'(103)',5X'(NZ)')
41  FORMAT (4I11,/)
C
50  FORMAT ('      OK',3F10.3)
60  FORMAT ('      OK 1',F10.3)
70  FORMAT ('      OK 2')
RETURN
END
```

C-----

```

1000 '==RAINFALL, RUNOFF & EVAPORATION DATA INPUT==
1010 '
1020 '      "D-TANK"
1030 '      THIS IS THE PROGRAM TO INPUT
1040 '      DATA FOR SUGAWARA TANK MODEL
1050 '      1 DISCHARGE
1060 '      2 EVAPORATION
1070 '      3 PRECIPITATION
1075 HOME
1080 PRINT : PRINT : PRINT
1083 PRINT "      DATA INPUT FOR TANK MODEL"
1085 PRINT "      INSERT DATA DISK" : PRINT
1090 INPUT "      PAUSE";C#
1100 RESET
1110 '
1120 '
1130 '
1140 '      BLOCK 0 INITIAL SETTING
1145 '      VERSION      1.0 A
1150 DIM BF(12,31),DM(12),M$(12)
1160 FOR I = 1 TO 12
1170   READ DM(I)
1180 NEXT I
1190 FOR I = 1 TO 12
1200   READ M$(I)
1210 NEXT I
1220   DATA 31,28,31,30,31,30,31,31,30,31,30,31
1230   DATA "JAN","FEB","MAR","APR","MAY","JUN"
1240   DATA "JUL","AUG","SEP","OCT","NOV","DEC"
1250 '      END OF BLOCK 0
1260 '
1270 '
1280 '
1290 '      BLOCK 1 MAIN PART
1300 HOME
1310 PRINT "      DATA TO BE EDIT" : PRINT
1320 PRINT "      1 = DISCHARGE"
1330 PRINT "      2 = EVAPORATION"
1340 PRINT "      3 = PRECIPITATION"
1350 PRINT "      4 = EXIT TO CP/M" : PRINT
1360 INPUT "      INPUT NUMBER "; I1
1370 IF I1=4 THEN END
1380 ON I1 GOSUB 1450,1540,1630
1390 GOTO 1300
1400 '      END OF BLOCK 1
1410 '
1420 '
1430 '
1440 '      BLOCK 2 DISCHARGE
1450 F$="FORT07.DAT"
1460 NS=1
1470 GOSUB 1740
1480 RETURN
1490 '      END OF BLOCK 2
1500 '
1510 '
1520 '
1530 '      BLOCK 3 EVAPORATION
1540 F$="FORT08.DAT"
1550 NS=1

```



```

1560 GOSUB 1740
1570 RETURN
1580 . END OF BLOCK 3
1590 .
1600 .
1610 .
1620 . BLOCK 4 PRECIPITATION
1630 F$="FORT09.DAT"
1640 INPUT " HOWMANY STATION "; NS
1650 GOSUB 1740
1660 RETURN
1670 . END OF BLOCK 4
1680 .
1690 .
1700 .
1710 . SUBROUTINE
1720 .
1730 . BLOCK 5 MAIN PART
1740 HOME
1750 PRINT " SELECT OPTION" : PRINT
1760 PRINT " 1 = INPUT DATA"
1770 PRINT " 2 = ADDING DATA"
1780 PRINT " 3 = CORECT DATA"
1790 PRINT " 4 = PRINT OUT"
1800 PRINT " 5 = DONE" : PRINT
1810 INPUT " INPUT NUMBER "; I2
1820 IF I2=5 THEN RETURN
1830 ON I2 GOSUB 1900,2000,2430,3160
1840 GOTO 1740
1850 . END OF BLOCK 5
1860 .
1870 .
1880 .
1890 . BLOCK 6 OPEN FILE
1900 OPEN "O",#1,F$
1910 IF (I1=3) THEN PRINT #1,USING"##";NS
1920 GOSUB 2070
1930 CLOSE
1940 RETURN
1950 . END OF BLOCK 6
1960 .
1970 .
1980 .
1990 . BLOCK 7 APPEND FILE
2000 GOSUB 2430
2010 RETURN
2020 . END OF BLOCK 7
2030 .
2040 .
2050 .
2060 . BLOCK 8 INPUT & APPEND DATA FOR BLOCK 6 & BLOCK 7
2070 FOR I = 1 TO 12
2080 FOR J = 1 TO 31
2090 BF(I,J)=0
2100 NEXT J
2110 NEXT I
2120 INPUT " YEAR "; Y1
2130 IF (Y1=0) THEN RETURN
2140 PRINT #1,USING"####";Y1
2150 Y2=Y1+1

```



```

2160 Y3=Y2/4
2170 IF (INT(Y3)=Y3) THEN DM(2)=29 ELSE DM(2)=28
2180 FOR I = 1 TO NS
2190   IF (I1=1) THEN PRINT "           DISCHARGE "
2200   IF (I1=2) THEN PRINT "           EVAPORATION"
2210   IF (I1=3) THEN PRINT "           PRECIPITATION"
2220   FOR M = 4 TO 15
2230     M2=M
2240     IF (M2>12) THEN M2=M2-12
2245     IF (I1=2) THEN GOSUB 2350 ELSE GOSUB 2250
2246     NEXT M
2247   NEXT I
2248   GOTO 2070
2250   THEN
2255   DD=DM(M2)
2260   FOR D = 1 TO DD
2270     PRINT "           ";M$(M2);"           ";D;"           ";
2280     INPUT BF(M2,D)
2300   NEXT D
2310   FOR D = 1 TO DD
2320     PRINT #1,USING"#####.###";BF(M2,D)
2330   NEXT D
2340   RETURN
2350   ELSE
2352     PRINT "           ";M$(M2);
2354     INPUT BF(M2,1)
2356     PRINT #1,USING"#####.###";BF(M2,1)
2358   RETURN
2380   END OF BLOCK 8
2390
2400
2410
2420   BLOCK 9 CORECT DATA
2430   OPEN "1",#2,F#
2440   OPEN "0",#1,"BK.DAT"
2450
2460   READ DATA
2470   NS=1
2480   IF (I1<3) GOTO 2510
2490   INPUT #2,NS
2500   PRINT #1,USING"##";NS
2510   IF (I2=2) THEN YC=0 ELSE YC=1
2520   IF (YC=0) GOTO 2540
2530   INPUT "           CORECTED YEAR "; YC
2540   FOR I = 1 TO NS
2550     IF EOF(2) GOTO 2990
2560     INPUT #2,Y1
2570     FOR M = 4 TO 15
2580       M2=M
2590       IF (M2>12) THEN M2=M2-12
2600       DD=DM(M2)
2610       FOR D = 1 TO DD
2620         INPUT #2,BF(M2,D)
2630         IF (I1=2) GOTO 2650
2640       NEXT D
2650     NEXT M
2660     IF (Y1<>YC) GOTO 2870
2670
2680   CORECT DATA
2690   N=1

```

```

2700     IF (I1<3) GOTO 2720
2710     INPUT "          STATION NUMBER "; N
2720     IF (N<>1) GOTO 2870
2730     INPUT "          MONTH "; N$
2740     IF (N$="OK") GOTO 2870
2750     FOR MN = 1 TO 12
2760         IF (M$(MN)=N$) GOTO 2790
2770     NEXT MN
2780     GOTO 2730
2790     INPUT "          DATE "; D2
2800     IF (D2<1) GOTO 2790
2810     IF (D2>DM(MN)) GOTO 2790
2820     PRINT "          "; M$(MN); "          "; D2; "          ";
2830     INPUT BF(MN, D2)
2840     GOTO 2730
2850
2860     WRITE
2870     PRINT #1, USING "####"; Y1
2880     FOR M = 4 TO 15
2890         M2=M
2900         IF (M2>12) THEN M2=M2-12
2910         DD=DM(M2)
2920         FOR D = 1 TO DD
2930             PRINT #1, USING "#####.###"; BF(M2, D)
2940             IF (I1=2) GOTO 2960
2950         NEXT D
2960     NEXT M
2970     NEXT I
2980     GOTO 2520
2990     INPUT " SOME DATA ADDING Y/N"; C$
3000     IF C$="N" GOTO 3070
3010     IF C$="Y" GOTO 3030
3020     GOTO 2990
3030     G$=F$
3040     F$="BK.DAT"
3050     GOSUB 2070
3060     F$=G$
3070     CLOSE
3080     KILL F$
3090     NAME "BK.DAT" AS F$
3100     RETURN
3110     END OF BLOCK 9
3120
3130
3140
3150     BLOCK 10 PRINT OUT
3160     OPEN "I", #1, F$
3170     LPRINT CHR$(8)HF)
3180     IF (I1<3) GOTO 3200
3190     INPUT #1, NS
3200     FOR M = 1 TO 12
3210         FOR D = 1 TO 31
3220             BF(M, D)=0
3230         NEXT D
3240     NEXT M
3250     IF EOF(1) GOTO 3520
3260     INPUT #1, Y1
3270     Y2=Y1+1
3280     Y3=Y2/4
3290     IF (INT(Y3)=Y3) THEN DM(2)=29 ELSE DM(2)=28

```



```

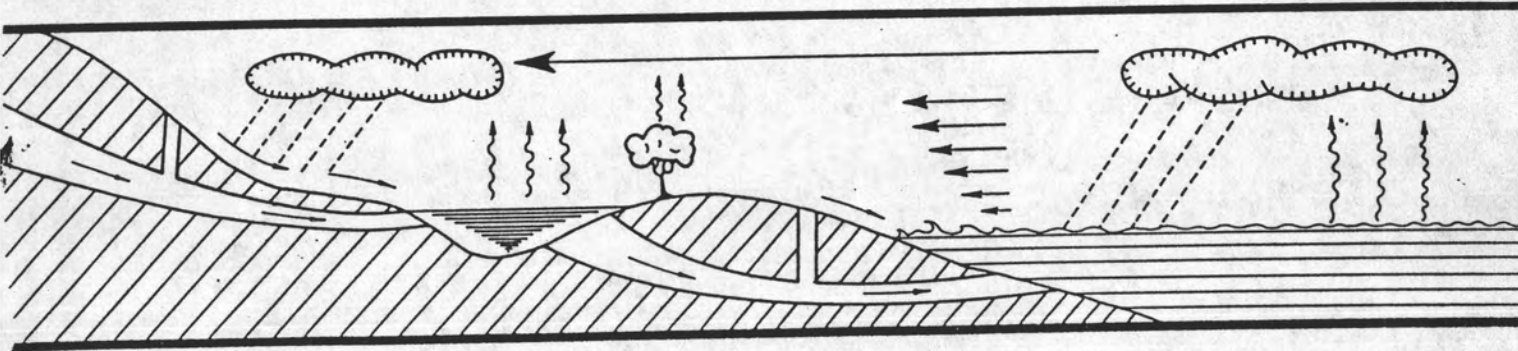
3300   FOR M = 4 TO 15
3310     M2=M
3320     IF (M2>12) THEN M2=M2-12
3330     DD=DM(M2)
3340     FOR D = 1 TO DD
3350       INPUT #1,BF(M2,D)
3360       IF (I1=2) GOTO 3380
3370     NEXT D
3380   NEXT M
3390   LPRINT "      WATER YEAR ";Y1

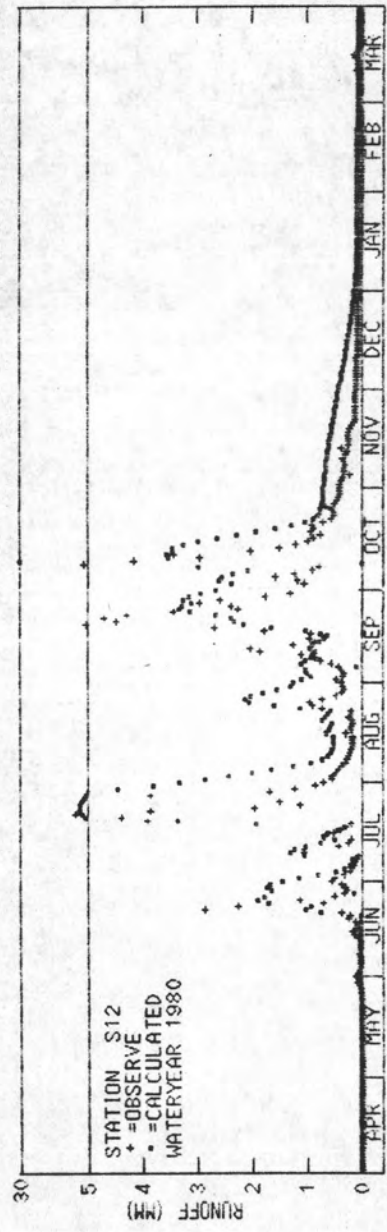
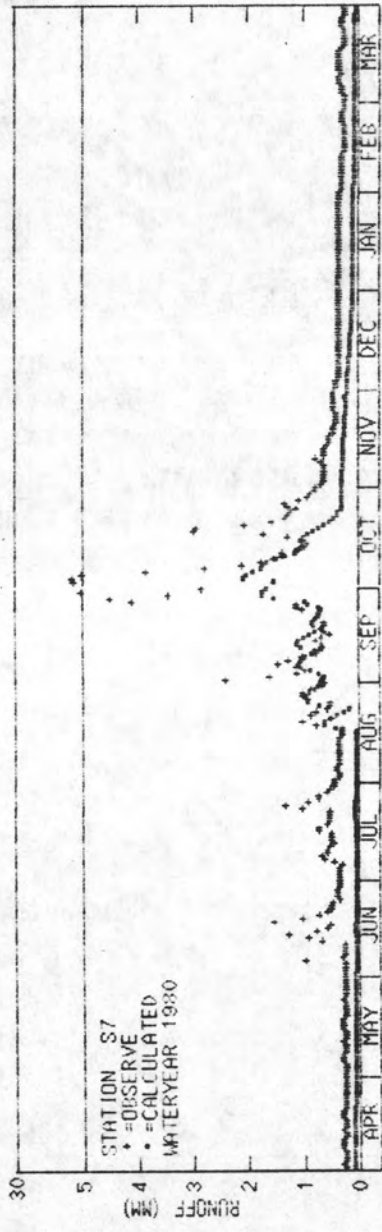
3400   LPRINT "  D          APR          MAY          JUN          JUL          AUG          SE
EB     MAR"
3410   FOR D = 1 TO 31
3420   LPRINT USING "  ##";D;
3430   FOR M = 4 TO 15
3440     M2=M
3450     IF (M2>12) THEN M2=M2-12
3460     LPRINT USING "#####.###";BF(M2,D),
3470   NEXT M
3480   LPRINT
3490   IF (I1=2) GOTO 3510
3500   NEXT D
3510   GOTO 3200
3520   CLOSE
3530   LPRINT CHR$(18);
3540   RETURN

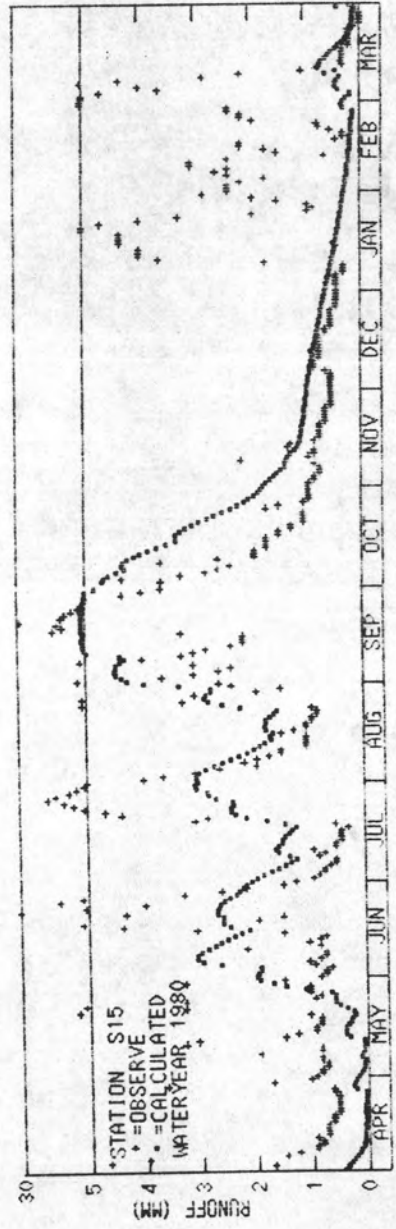
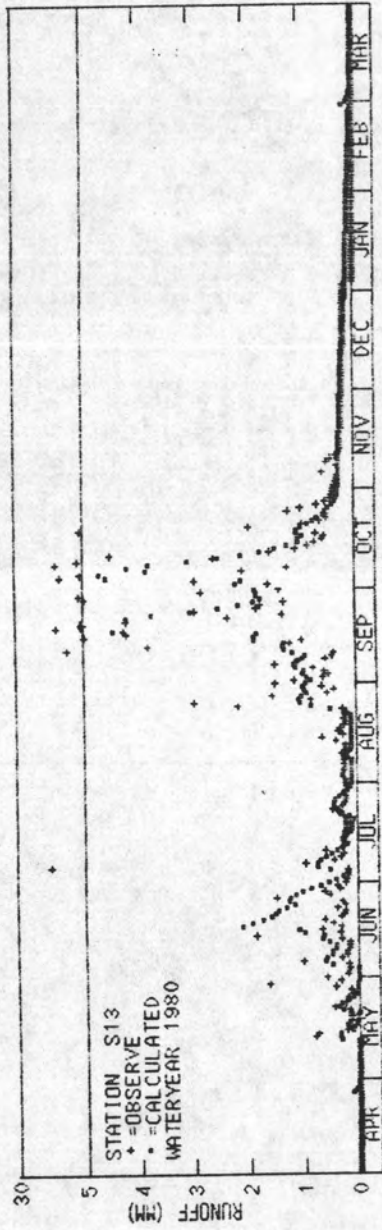
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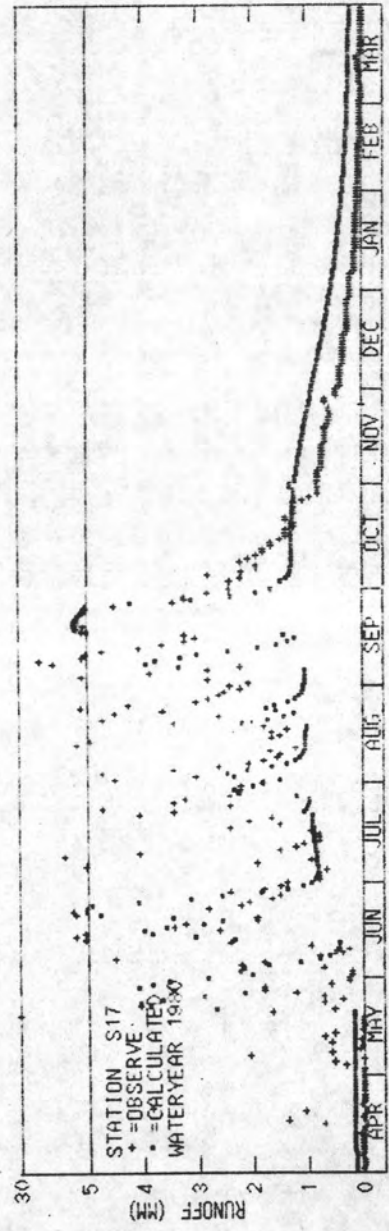
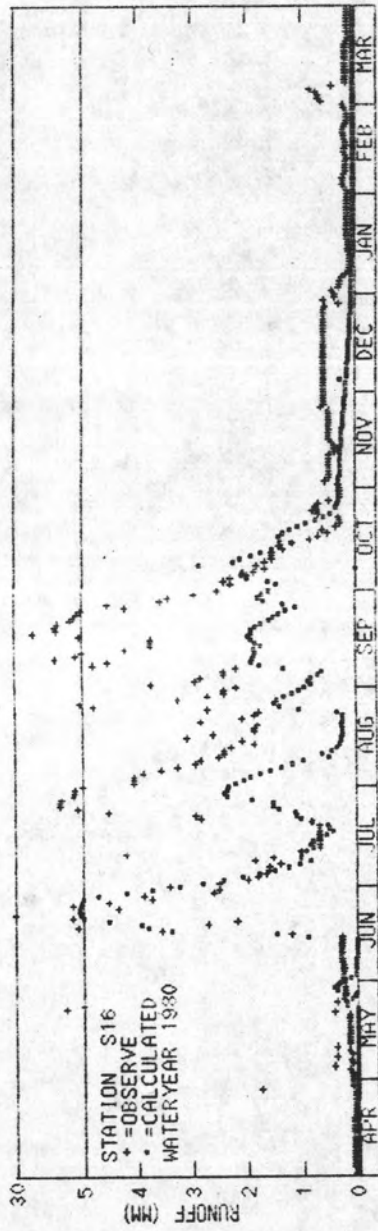

ภาคผนวก ค

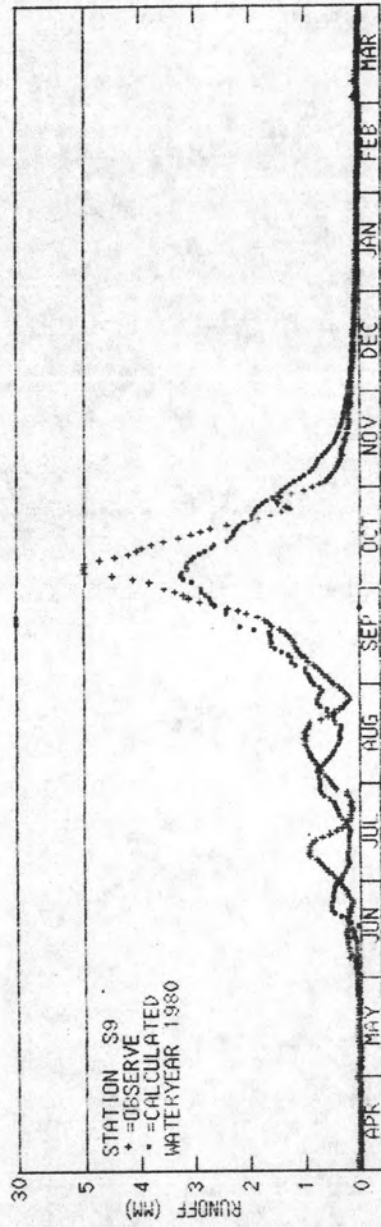
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ประวัติผู้เขียน

นายวีระชัย ชูพิศาลยโรจน์ เกิดเมื่อวันที่ 15 กรกฎาคม พ.ศ. 2499 ที่จังหวัด
พิษณุโลก สำเร็จการศึกษาวิศวกรรมศาสตรบัณฑิต คณะวิศวกรรมศาสตร์ มหาวิทยาลัย
เกษตรศาสตร์ เมื่อปีการศึกษา 2523 และได้เข้าศึกษาต่อในคณะวิศวกรรมศาสตร์ สาขา
วิศวกรรมโยธา ภาควิชาวิศวกรรมแหล่งน้ำ จุฬาลงกรณ์มหาวิทยาลัย เมื่อปี พ.ศ. 2525

