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**SYNTHETIC DATA GENERATOR-  
A JOINT DISTRIBUTION TECHNIQUE**

BY

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**FLOOD CONTROL DISTRICT**  
WEST PALM BEACH . . . . . FLORIDA

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SYNTHETIC DATA GENERATOR -  
A JOINT DISTRIBUTION TECHNIQUE  
(Technical Supplement)

by

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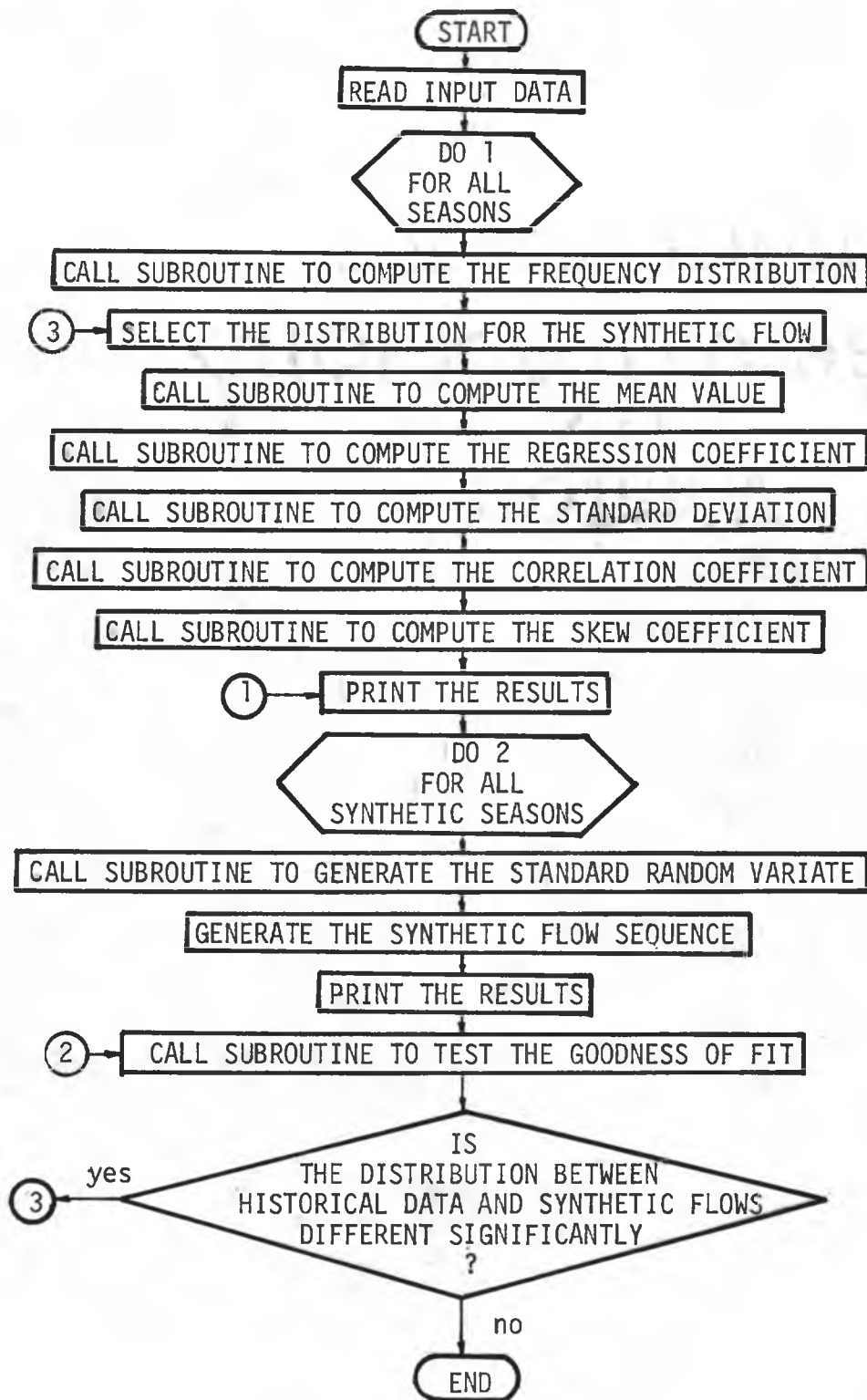
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## PREFACE

This publication is a technical supplement to technical publication No. 76-1, 1976 entitled, "Synthetic Data Generator - A Joint Distribution Technique" by Sun-Fu Shih, Resource Planning Department, Central and Southern Florida Flood Control District. The main portions of this technical supplement are the systematic flow chart for the synthetic process; the nomenclature for computer programs; and the computer programs for synthetic monthly data based on normal distribution, log normal distribution, log Pearson Type III distribution and square root normal distribution. The subroutine programs used to compute the mean value of data, the trend of data, variance and standard deviation, the correlation coefficient, the skewness coefficient, a normally distributed random number with a given mean and standard deviation, generating the random number, the frequency distribution, and Chi-square test for goodness-of-fit, are also included.

APPENDIX 1: Systematic Flow Chart For Synthetic Streamflow.



## APPENDIX 2. Nomenclature for Computer Programs

### 1. Input Variable Definitions:

|        |                                                                                      |
|--------|--------------------------------------------------------------------------------------|
| ANAME  | Identification readings for job output                                               |
| L      | Years of observed data                                                               |
| NS     | Number of seasons per year (for example, 12 months in monthly synthesized sequence). |
| NF     | Number of intervals used in frequency analysis                                       |
| A(I,J) | Monthly streamflow data                                                              |
| L1     | Length of years to be generated                                                      |

### 2. Output Variable Definitions:

|         |                                                                                    |
|---------|------------------------------------------------------------------------------------|
| AA(I)   | Annual observed streamflow                                                         |
| J       | Month index                                                                        |
| XM(J)   | Mean value of jth month                                                            |
| XB(J)   | Regression coefficient for estimating flow in (jth)st month from that of ith month |
| XSIG(J) | Standard deviation of observed streamflow for jth month                            |
| RH(J)   | Lag one correlation between flows in jth and (j+1)st months.                       |
| X(I+1)  | Synthesized flow in (I+1)st month                                                  |
| S1      | Sum of negative values of the synthesized sequence                                 |
| I1      | Number of negative values occurring during the generating process                  |
| S2      | Total value of the synthesized sequence                                            |
| VA      | Variance of the synthesized flow sequence                                          |
| SIG     | Standard deviation of the synthesized flow sequence                                |
| DV      | Average monthly value of the synthesized flow sequence                             |
| X5(J)   | Annual synthesized flow in jth year                                                |

APPENDIX 2. (continued)

|            |                                                       |
|------------|-------------------------------------------------------|
| YMAX       | Maximum value in the flow sequence                    |
| YMIN       | Minimum value in the flow sequence                    |
| YY(I+1)    | Frequency interval used in frequency subroutine       |
| N(I)       | Number of time occurrence in ith interval             |
| XN(I)      | Percent of time occurrence in ith interval            |
| XNN(I+1)   | Percent of time equal to or less than value indicated |
| YI(I+1,J1) | Frequency of ith interval in J1th month               |
| J1         | Month index used in Chi-square tests                  |
| XSQ        | Chi-square test value                                 |
| SKC        | Skewness coefficient                                  |

APPENDIX 3. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY  
STREAMFLOW BASED ON THE NORMAL DISTRIBUTION  
(SFLOWND)



```

PROGRAM SLOWND
C SYNTHETIC FLOW BASED ON THE NORMAL DISTRIBUTION
  DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
  DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
  READ(60,10) (ANME(I),I=1,10)
10 FORMAT(10A8)
  WRITE(61,11) (ANME(I),I=1,10)
11 FORMAT(1H1,10X,10A8//)
C L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C A(I,J)= MONTHLY STREAMFLOW DATA
C L1=SYNTHETIC YEARS, NF=NO. OF FREQUENCY INTERVAL.
  READ(60,1) L,NS,NF
  1 FORMAT(3I10)
  WRITE(61,30)
30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
  DO 5 I=1,L
  READ(60,2) (A(I,J),J=1,NS)
  AB=0.0
  DO 14 J=1,NS
14 AB=AB+A(I,J)
  AA(I)=AB
  5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  WRITE(61,31)
31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
  DO 19 I=1,L
  DO 20 J=1,NS
20 A(I,J)=A(I,J)*1.983471
  AA(I)=AA(I)*1.983471
19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  2 FORMAT(8X,12F6.0)
13 FORMAT(13F9.2)
  WRITE(61,32)
32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
  CALL FREQ(AA,L,NF,Y1,Y2)
  NF1=NF+1
  Y11(1,13)=Y1(1)
  DO 23 I1=2,NF1
  I3=I1-1
  Y11(I1,13)=Y1(I1)
23 Y22(I3,13)=Y2(I3)
  DO 4 J=1,NS
  DO 3 I=1,L
  3 X(I)=A(I,J)
  WRITE(61,33) J
33 FORMAT(/2X,6HMONTH=,I4,25H FREQUENCY DISTRIBUTION//)
  CALL FREQ(X,L,NF,Y1,Y2)
  Y11(1,J)=Y1(1)
  DO 24 I2=2,NF1
  I3=I2-1
  Y11(I2,J)=Y1(I2)
24 Y22(I3,J)=Y2(I3)
  CALL AGM11(X,L,XMU)
  XM(J)=XMU
  IF(J.EQ.NS) GO TO 6
  DO 9 I=1,L
  9 X1(I)=A(I,J+1)
  GO TO 7
  6 DO 8 I=1,L
  8 X1(I)=A(I,1)
  7 CALL AGM11(X1,L,XM1)
  CALL AG12A(B,X,X1,L,XMU,XM1)

```

```

XB(J)=B
CALL AGM22(VAR,SIGMA,X,L,XMU)
XSIG(J)=SIGMA
SIG1=SIGMA
CALL AGM22(VAR,SIGMA,X1,L,XM1)
SIG2=SIGMA
CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
RH(J)=RHO
4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
22 FORMAT(/2X,5HMEAN=,F15.6,14H REG. COEF.=,F10.6,12H ST. DEV.=,F
115.6,15H CORR. COEF.=,F9.6/)
16 READ(60,1) L1
IF(L1.EQ.0) GO TO 17
WRITE(61,18) L1
18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
GO TO 16
17 CALL EXIT
END

```

```

C
SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
DIMENSION X5(501),Y11(21,13),Y22(21,13)
IX=135
AM=0.0
S=1.0
I=1
X(I)=XMU(1)
XMU(13)=XMU(1)
XSIG(13)=XSIG(1)
I1=0
S1=0.0
S2=X(I)/10000.
X111=X(I)
DO 2 K=1,L1
DO 2 J=1,NS
TERM1=B(J)*(X111-XMU(J))
CALL GAUSS(IX,IY,S,AM,Z)
IX=IY
TERM2=1-RHO(J)*RHO(J)
TERM3=Z*SQRT(TERM2)*XSIG(J+1)
X(I+1)=XMU(J+1)+TERM1+TERM3
IF(X(I+1)) 6,10,10
6 WRITE(61,3) X(I+1)
S1=S1+X(I+1)
X(I+1)=0.0
I1=I1+1
10 S2=S2+X(I+1)/10000.0
X111=X(I+1)
I=I+1
2 CONTINUE
WRITE(61,9) S1,I1,S2
9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H NO. OF N. V. =,I10,
118H TOTAL VOL 10**4=,F20.6)
WRITE(61,3)(X(J),J=1,I)
3 FORMAT(12F10.2)
KI=1
DO 5 J=1,NS
KK=1

```

```

SUM=0.0
DO 4 K=KI,I,12
X5(KK)=X(K)
KK=KK+1
4 SUM=SUM+X(K)
CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
KI=KI+1
DV=SUM/L1
CALL AGM22(VA,SIG,X5,L1,DV)
WRITE(61,15) VA,SIG
15 FORMAT(/2X,9HVARIANCE=,F20.6,17H STANDARD DEV.=,F20.6/)
5 WRITE(61,12) DV
12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
NN=NS
KK=1
DO 8 J=1,L1
SU=0.0
DO 7 K=KK,NN
7 SU=SU+X(K)
X5(J)=SU
KK=KK+NS
8 NN=NN+NS
WRITE(61,14)
14 FORMAT(/10X,21HANNUAL SYNTHETIC FLOW/)
WRITE(61,3) (X5(J),J=1,L1)
CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
RETURN
END

```

APPENDIX 4. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW  
BASED ON THE Log NORMAL DISTRIBUTION (SFLOWLD)

```

PROGRAM SFLOWLD
C SYNTHETIC FLOW BASED ON THE LOG NORMAL DISTRIBUTION
  DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
  DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
  READ(60,10) (ANME(I),I=1,10)
10 FORMAT(10A8)
  WRITE(61,11) (ANME(I),I=1,10)
11 FORMAT(1H1,10X,10A8//)
C L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C A(I,J)= MONTHLY STREAMFLOW DATA
C L1=SYNTHETIC YEARS, NF=NO. OF FREQUENCY INTERVAL.
  READ(60,1) L,NS,NF
  1 FORMAT(3I10)
  WRITE(61,30)
30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
  DO 5 I=1,L
  READ(60,2) (A(I,J),J=1,NS)
  AB=0.0
  DO 14 J=1,NS
14 AB=AB+A(I,J)
  AA(I)=AB
  5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  WRITE(61,31)
31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
  DO 19 I=1,L
  DO 20 J=1,NS
20 A(I,J)=A(I,J)*1.983471
  AA(I)=AA(I)*1.983471
19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  2 FORMAT(8X,12F6.0)
13 FORMAT(13F9.2)
  WRITE(61,32)
32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
  CALL FREQ(AA,L,NF,Y1,Y2)
  NF1=NF+1
  Y11(1,13)=Y1(1)
  DO 23 I1=2,NF1
  I3=I1-1
  Y11(I1,13)=Y1(I1)
23 Y22(I3,13)=Y2(I3)
  DO 4 J=1,NS
  DO 3 I=1,L
  3 X(I)=A(I,J)
  WRITE(61,33) J
33 FORMAT(/2X,6HMONTH=,I4,25H FREQUENCY DISTRIBUTION//)
  CALL FREQ(X,L,NF,Y1,Y2)
  Y11(1,J)=Y1(1)
  DO 24 I2=2,NF1
  I3=I2-1
  Y11(I2,J)=Y1(I2)
24 Y22(I3,J)=Y2(I3)
  DO 21 I=1,L
  IF(X(I).EQ.0.0) X(I)=1.0
21 X(I)=ALOG(X(I))
  CALL AGM11(X,L,XMU)
  XM(J)=XMU
  IF(J.EQ.NS) GO TO 6
  DO 9 I=1,L
  9 X1(I)=ALOG(A(I,J+1))
  GO TO 7
  6 DO 8 I=1,L

```

```

8 X1(I)=ALOG(A(I,1))
7 CALL AGM11(X1,L,XM1)
  CALL AG12A(B,X,X1,L,XMU,XM1)
  XB(J)=B
  CALL AGM22(VAR,SIGMA,X,L,XMU)
  XSIG(J)=SIGMA
  SIG1=SIGMA
  CALL AGM22(VAR,SIGMA,X1,L,XM1)
  SIG2=SIGMA
  CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
  RH(J)=RHO
4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
22 FORMAT(/2X,5HMEAN=,F15.6,14H REG. COEF.=,F10.6,12H ST. DEV.=,F
115.6,15H CORR. COEF.=,F9.6/)
16 READ(60,1) L1
  IF(L1.EQ.0) GO TO 17
  WRITE(61,18) L1
18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
  CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
  GO TO 16
17 CALL EXIT
  END

```

```

C SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
  SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
  DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
  DIMENSION X5(501),Y11(21,13),Y22(21,13)
  IX=135
  AM=0.0
  S=1.0
  I=1
  X11=XMU(1)
C X(I)=10.0**X11
  X(I)=EXP(X11)
  XMU(13)=XMU(1)
  XSIG(13)=XSIG(1)
  I1=0
  S1=0.0
  S2=X(I)/10000.
  DO 2 K=1,L1
  DO 2 J=1,NS
    TERM1=B(J)*(X11-XMU(J))
    CALL GAUSS(IX,IY,S,AM,Z)
    IX=IY
    TERM2=1-RHO(J)*RHO(J)
    TERM3=Z*XSIG(J+1)*SQRT(TERM2)
    X12=XMU(J+1)+TERM1+TERM3
    IF(X12) 6,10,10
6 WRITE(61,3) X12
  X12=0.0
  S1=S1+EXP(X12)
  I1=I1+1
10 X(I+1)=EXP(X12)
  S2=S2+X(I+1)/10000.0
  X11=X12
  I=I+1
2 CONTINUE
  WRITE(61,9) S1,I1,S2
9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H NO. OF N. V. =,I10,
118H TOTAL VOL 10**4=,F20.6)

```

```

WRITE(61,3)(X(J),J=1,I)
3 FORMAT(12F10.2)
KI=1
DO 5 J=1,NS
KK=1
SUM=0.0
DO 4 K=KI,I,12
X5(KK)=X(K)
KK=KK+1
4 SUM=SUM+X(K)
CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
KI=KI+1
DV=SUM/L1
CALL AGM22(VA,SIG,X5,L1,DV)
WRITE(61,15) VA,SIG
15 FORMAT(/2X,9HVARIANCE=,F20.6,17H STANDARD DEV.=,F20.6/)
5 WRITE(61,12) DV
12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
NN=NS
KK=1
DO 8 J=1,L1
SU=0.0
DO 7 K=KK,NN
7 SU=SU+X(K)
X5(J)=SU
KK=KK+NS
8 NN=NN+NS
WRITE(61,14)
14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
WRITE(61,3) (X5(J),J=1,L1)
CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
RETURN
END

```

APPENDIX 5. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW  
BASED ON THE Log PEARSON TYPE III DISTRIBUTION  
(SFLOWLPD)



```

PROGRAM SFLOWLPD
C SYNTHETIC FLOW BASED ON THE LOG PEARSON TYPE III DISTRIBUTION
  DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
  DIMENSION ANME(I0),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
  DIMENSION SK(13),X2(45),X3(45),XMM(13),XSI(13)
  READ(60,10) (ANME(I),I=1,10)
10 FORMAT(10A8)
  WRITE(61,11) (ANME(I),I=1,10)
11 FORMAT(1H1,10X,10A8//)
C L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C A(I,J)= MONTHLY STREAMFLOW DATA
C L1=SYNTHETIC YEARS, NF=NO. OF FREQUENCY INTERVAL.
  READ(60,1) L,NS,NF
  1 FORMAT(3I10)
  WRITE(61,30)
30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
  DO 5 I=1,L
  READ(60,2) (A(I,J),J=1,NS)
  AB=0.0
  DO 14 J=1,NS
14 AB=AB+A(I,J)
  AA(I)=AB
  5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  WRITE(61,31)
31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
  DO 19 I=1,L
  DO 20 J=1,NS
20 A(I,J)=A(I,J)*1.983471
  AA(I)=AA(I)*1.983471
19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  2 FORMAT(8X,12F6.0)
13 FORMAT(13F9.2)
  WRITE(61,32)
32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
  CALL FREQ(AA,L,NF,Y1,Y2)
  NF1=NF+1
  Y11(1,13)=Y1(1)
  DO 23 I1=2,NF1
  I3=I1-1
  Y11(I1,13)=Y1(I1)
23 Y22(I3,13)=Y2(I3)
  DO 4 J=1,NS
  DO 3 I=1,L
  3 X(I)=A(I,J)
  WRITE(61,33) J
33 FORMAT(/2X,6HMONTH=,I4,25H FREQUENCY DISTRIBUTION//)
  CALL FREQ(X,L,NF,Y1,Y2)
  Y11(1,J)=Y1(1)
  DO 24 I2=2,NF1
  I3=I2-1
  Y11(I2,J)=Y1(I2)
24 Y22(I3,J)=Y2(I3)
  DO 21 I=1,L
  IF(X(I).EQ.0.0) X(I)=1.0
21 X(I)=ALOG(X(I))
  CALL AGM11(X,L,XMU)
  XMM(J)=XMU
  CALL AGM22(VAR,SIGMA,X,L,XMU)
  XSI(J)=SIGMA
  CALL AGM23(X,L,XMU,SIGMA,SKC)
  SK(J)=SKC

```

```

CALL AGM24(X,L,XMU,SIGMA,X2)
WRITE(61,13) (X2(I),I=1,L)
CALL AGM25(X2,L,SKC,X3)
WRITE(61,13) (X3(I),I=1,L)
IF(J.EQ.NS) GO TO 6
DO 9 I=1,L
9 X(I)=ALOG(A(I,J+1))
GO TO 7
6 DO 8 I=1,L
8 X(I)=ALOG(A(I,1))
7 CALL AGM11(X,L,XMU)
CALL AGM22(VAR,SIGMA,X,L,XMU)
CALL AGM23(X,L,XMU,SIGMA,SKC)
CALL AGM24(X,L,XMU,SIGMA,X2)
CALL AGM25(X2,L,SKC,X1)
CALL AGM11(X3,L,XMU)
XM(J)=XMU
CALL AGM11(X1,L,XM1)
CALL AG12A(B,X3,X1,L,XMU,XM1)
XB(J)=B
CALL AGM22(VAR,SIGMA,X3,L,XMU)
XSIG(J)=SIGMA
SIG1=SIGMA
CALL AGM22(VAR,SIGMA,X1,L,XM1)
SIG2=SIGMA
CALL AGM32(SIG1,SIG2,L,X3,X1,XMU,XM1,RHO)
RH(J)=RHO
4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
22 FORMAT(/2X,5HMEAN=,F15.6,14H REG. COEF.=,F10.6,12H ST. DEV.=,F
115.6,15H CORR. COEF.=,F9.6/)
16 READ(60,1) L1
IF(L1.EQ.0) GO TO 17
WRITE(61,18) L1
18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22,SK,XMM,XSI)
GO TO 16
17 CALL EXIT
END

```

```

SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22,SK,XMM,XSI)
DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
DIMENSION X5(501),Y11(21,13),Y22(21,13),SK(13),XMM(13),XSI(13)
C SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
IX=135
AM=0.0
S=1.0
I=1
X11=XMU(1)
TP1=(SK(1)/6.0)*(X11-SK(I)/6.0)+1.0
TP2=1.0
IF(TP1.GE.0.0) GO TO 15
TP1=-TP1
TP2=-1.0
15 X14=(TP2*TP1**3.0-1.0)*2.0/SK(1)
X15=X14*XSI(1)+XMM(1)
X(I)=EXP(X15)
XMU(13)=XMU(1)
XSIG(13)=XSIG(1)
SK(13)=SK(1)
XMM(13)=XMM(1)

```

```

XSI(13)=XSI(1)
I1=0
S1=0.0
S2=X(I)/10000.
DO 2 K=1,L1
DO 2 J=1,NS
TERM1=B(J)*(X11-XMU(J))
CALL GAUSS(IX,IY,S,AM,Z)
IX=IY
TERM2=1-RHO(J)*RHO(J)
TERM3=Z*XSIG(J+1)*SQRT(TERM2)
X12=XMU(J+1)+TERM1+TERM3
IF(X12) 6,10,10
6 CONTINUE
S1=S1+X12
I1=I1+1
10 TP1=(SK(J+1)/6.0)*(X12-SK(J+1)/6.0)+1.0
TP2=1.0
IF(TP1.GE.0.0) GO TO 16
TP1=-TP1
TP2=-1.0
16 X14=(TP2*TP1**3.0-1.0)*2.0/SK(J+1)
X15=X14*XSI(J+1)+XMM(J+1)
X(I+1)=EXP(X15)
S2=S2+X(I+1)/10000.0
X11=X12
I=I+1
2 CONTINUE
WRITE(61,9) S1,I1,S2
9 FORMAT(2X,22H SUM OF NEGATIVE VALUE=,F15.5,16H NO. OF N. V. =,I10,
118H TOTAL VOL 10**4=,F20.6)
WRITE(61,3) (X(J),J=1,I)
3 FORMAT(12F10.2)
KI=1
DO 5 J=1,NS
KK=1
SUM=0.0
DO 4 K=KI,I,12
X5(KK)=X(K)
KK=KK+1
4 SUM=SUM+X(K)
CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
KI=KI+1
DV=SUM/L1
CALL AGM22(VA,SIG,X5,L1,DV)
WRITE(61,15) VA,SIG
15 FORMAT(/2X,9HVARIANCE=,F20.6,17H STANDARD DEV.=,F20.6/)
5 WRITE(61,12) DV
12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
NN=NS
KK=1
DO 8 J=1,L1
SU=0.0
DO 7 K=KK,NN
7 SU=SU+X(K)
X5(J)=SU
KK=KK+NS
8 NN=NN+NS
WRITE(61,14)
14 FORMAT(/10X,21HANNUAL SYNTHETIC FLOW/)
WRITE(61,3) (X5(J),J=1,L1)
CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)

```

RETURN  
END

C SUBROUTINE AGM23(X,N,XM,SIG,SKC)  
  COMPUTE SKEWNESS COEFFICIENTS  
  DIMENSION X(1)  
  SUM=0.0  
  DO 1 I=1,N  
  DIFFS=(X(I)-XM)\*(X(I)-XM)\*(X(I)-XM)  
1 SUM=SUM+DIFFS  
  FN=N  
  SKC=FN\*SUM/((FN-1.0)\*(FN-2.0)\*SIG\*SIG\*SIG)  
  WRITE(61,2) SKC  
2 FORMAT(/2X,21HSKEWNESS COEFFICIENT=,F20.6/)  
  RETURN  
  END

C SUBROUTINE AGM24(X,N,XM,SIG,X2)  
  DIMENSION X(1),X2(1)  
  X2=(X-M)/S  
  DO 1 I=1,N  
1 X2(I)=(X(I)-XM)/SIG  
  RETURN  
  END

C SUBROUTINE AGM25(X2,N,SKC,X3)  
  NORMAL STANDARD DEVIATE  
  DIMENSION X2(1),X3(1)  
  DO 1 I=1,N  
  S1=X2(I)\*SKC\*0.5+1.0  
  TP=1.0  
  IF(S1.GE.0.0) GO TO 2  
  S1=-S1  
  TP=-1.0  
2 X3(I)=(6.0/SKC)\*(TP\*S1\*\*((1.0/3.0)-1.0)+SKC/6.0  
1 CONTINUE  
  RETURN  
  END

APPENDIX 6. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW  
BASED ON THE SQUARE ROOT NORMAL DISTRIBUTION (SFLOWSD)

```

PROGRAM SFLOWSD
C SYNTHETIC FLOW BASED ON THE SQUARE ROOT DISTRIBUTION
  DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
  DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
  READ(60,10) (ANME(I),I=1,10)
10 FORMAT(10A8)
  WRITE(61,11) (ANME(I),I=1,10)
11 FORMAT(1H1,10X,10A8//)
C L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C A(I,J)= MONTHLY STREAMFLOW DATA
C L1=SYNTHETIC YEARS, NF=NO. OF FREQUENCY INTERVAL.
  READ(60,1) L,NS,NF
  1 FORMAT(3I10)
  WRITE(61,30)
30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
  DO 5 I=1,L
  READ(60,2) (A(I,J),J=1,NS)
  AB=0.0
  DO 14 J=1,NS
14 AB=AB+A(I,J)
  AA(I)=AB
  5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  WRITE(61,31)
31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
  DO 19 I=1,L
  DO 20 J=1,NS
20 A(I,J)=A(I,J)*1.983471
  AA(I)=AA(I)*1.983471
19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  2 FORMAT(8X,12F6.0)
13 FORMAT(13F9.2)
  WRITE(61,32)
32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
  CALL FREQ(AA,L,NF,Y1,Y2)
  NF1=NF+1
  Y11(1,13)=Y1(1)
  DO 23 I1=2,NF1
  I3=I1-1
  Y11(I1,13)=Y1(I1)
23 Y22(I3,13)=Y2(I3)
  DO 4 J=1,NS
  DO 3 I=1,L
  3 X(I)=A(I,J)
  WRITE(61,33) J
33 FORMAT(/2X,6HMONTH=,I4,25H FREQUENCY DISTRIBUTION//)
  CALL FREQ(X,L,NF,Y1,Y2)
  Y11(1,J)=Y1(1)
  DO 24 I2=2,NF1
  I3=I2-1
  Y11(I2,J)=Y1(I2)
24 Y22(I3,J)=Y2(I3)
  DO 21 I=1,L
  IF(X(I).EQ.0.0) X(I)=1.0
21 X(I)=SQRT(X(I))
  CALL AGM11(X,L,XMU)
  XM(J)=XMU
  IF(J.EQ.NS) GO TO 6
  DO 9 I=1,L
  9 X1(I)=SQRT(A(I,J+1))
  GO TO 7
  6 DO 8 I=1,L

```

```

8 X1(I)=SQRT(A(I,1))
7 CALL AGM11(X1,L,XM1)
  CALL AG12A(B,X,X1,L,XMU,XM1)
  XB(J)=B
  CALL AGM22(VAR,SIGMA,X,L,XMU)
  XSIG(J)=SIGMA
  SIG1=SIGMA
  CALL AGM22(VAR,SIGMA,X1,L,XM1)
  SIG2=SIGMA
  CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
  RH(J)=RHO
4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
22 FORMAT(/2X,5HMEAN=,F15.6,14H REG. COEF.=,F10.6,12H ST. DEV.=,F
  115.6,15H CORR. COEF.=,F9.6/)
16 READ(60,1) L1
  IF(L1.EQ.0) GO TO 17
  WRITE(61,18) L1
18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
  CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
  GO TO 16
17 CALL EXIT
  END

```

```

C SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
  SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
  DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
  DIMENSION X5(501),Y11(21,13),Y22(21,13)
  IX=135
  AM=0.0
  S=1.0
  I=1
  X(I)=XMU(1)*XMU(1)
  X11=X(I)
  XMU(13)=XMU(1)
  XSIG(13)=XSIG(1)
  I1=0
  S1=0.0
  S2=X(I)/10000.
  DO 2 K=1,L1
  DO 2 J=1,NS
  X11=SQRT(X11)
  TERM1=B(J)*(X11-XMU(J))
  CALL GAUSS(IX,IY,S,AM,Z)
  IX=IY
  TERM2=1-RHO(J)*RHO(J)
  TERM3=Z*XSIG(J+1)*SQRT(TERM2)
  X12=(XMU(J+1)+TERM1+TERM3)*(XMU(J+1)+TERM1+TERM3)
  IF(X12) 6,10,10
6 WRITE(61,3) X12
  S1=S1+X12
  X12=0.0
  I1=I1+1
10 X(I+1)=X12
  S2=S2+X(I+1)/10000.0
  X11=X12
  I=I+1
2 CONTINUE
  WRITE(61,9) S1,I1,S2
9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H NO. OF N. V. =,I10,
  118H TOTAL VOL 10**4=,F20.6)

```

```

WRITE(61,3) (X(J),J=1,I)
3 FORMAT(12F10.2)
KI=1
DO 5 J=1,NS
KK=1
SUM=0.0
DO 4 K=KI,I,12
X5(KK)=X(K)
KK=KK+1
4 SUM=SUM+X(K)
CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
KI=KI+1
DV=SUM/L1
CALL AGM22(VA,SIG,X5,L1,DV)
WRITE(61,15) VA,SIG
15 FORMAT(/2X,9HVARIANCE=,F20.6,17H STANDARD DEV.=,F20.6/)
5 WRITE(61,12) DV
12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
NN=NS
KK=1
DO 8 J=1,L1
SU=0.0
DO 7 K=KK,NN
7 SU=SU+X(K)
X5(J)=SU
KK=KK+NS
8 NN=NN+NS
WRITE(61,14)
14 FORMAT(/10X,21HANNUAL SYNTHETIC FLOW/)
WRITE(61,3) (X5(J),J=1,L1)
CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
RETURN
END

```



APPENDIX 7. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW  
BASED ON THE JOINING OF NORMAL AND SQUARE ROOT  
DISTRIBUTION (NSD)

```

PROGRAM SFLOWNSD
C SYNTHETIC FLOW BASED ON NORMAL AND SQUARE ROOT DISTRIBUTION
  DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
  DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
  DIMENSION X2(45),X3(45),XMS(13),XBB(13),XSI(13),RHH(13)
  READ(60,10) (ANME(I),I=1,10)
10 FORMAT(10A8)
  WRITE(61,11) (ANME(I),I=1,10)
11 FORMAT(1H1,10X,10A8//)
C L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C A(I,J)= MONTHLY STREAMFLOW DATA
C L1=SYNTHETIC YEARS, NF=NO. OF FREQUENCY INTERVAL.
  READ(60,1) L,NS,NF
  1 FORMAT(3I10)
  WRITE(61,30)
30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
  DO 5 I=1,L
  READ(60,2) (A(I,J),J=1,NS)
  AB=0.0
  DO 14 J=1,NS
14 AB=AB+A(I,J)
  AA(I)=AB
  5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  WRITE(61,31)
31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
  DO 19 I=1,L
  DO 20 J=1,NS
20 A(I,J)=A(I,J)*1.983471
  AA(I)=AA(I)*1.983471
19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
  2 FORMAT(8X,12F6.0)
13 FORMAT(13F9.2)
  WRITE(61,32)
32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
  CALL FREQ(AA,L,NF,Y1,Y2)
  NF1=NF+1
  Y11(1,13)=Y1(1)
  DO 23 I1=2,NF1
  I3=I1-1
  Y11(I1,13)=Y1(I1)
23 Y22(I3,13)=Y2(I3)
  DO 4 J=1,NS
  DO 3 I=1,L
  X2(I)=SQRT(A(I,J))
  3 X(I)=A(I,J)
  WRITE(61,33) J
33 FORMAT(/2X,6HMONTH=,I4,25H FREQUENCY DISTRIBUTION//)
  CALL FREQ(X,L,NF,Y1,Y2)
  Y11(1,J)=Y1(1)
  DO 24 I2=2,NF1
  I3=I2-1
  Y11(I2,J)=Y1(I2)
24 Y22(I3,J)=Y2(I3)
  CALL AGM11(X,L,XMU)
  XM(J)=XMU
  CALL AGM11(X2,L,XM2)
  XMS(J)=XM2
  IF(J.EQ.NS) GO TO 6
  DO 9 I=1,L
  X3(I)=SQRT(A(I,J+1))
  9 X1(I)=A(I,J+1)

```

```

GO TO 7
6 DO 8 I=1,L
  X3(I)=SQRT(A(I,1))
8 X1(I)=A(I,1)
7 CALL AGM11(X1,L,XM1)
  CALL AG12A(B,X,X1,L,XMU,XM1)
  XB(J)=B
  CALL AGM22(VAR,SIGMA,X,L,XMU)
  XSIG(J)=SIGMA
  SIG1=SIGMA
  CALL AGM22(VAR,SIGMA,X1,L,XM1)
  SIG2=SIGMA
  CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
  RH(J)=RHO
  CALL AGM11(X3,L,XM3)
  CALL AG12A(BB,X2,X3,L,XM2,XM3)
  XBB(J)=BB
  CALL AGM22(VAR,SIGM,X2,L,XM2)
  XSI(J)=SIGM
  SIG3=SIGM
  CALL AGM22(VAR,SIGM,X3,L,XM3)
  SIG4=SIGM
  CALL AGM32(SIG3,SIG4,L,X2,X3,XM2,XM3,RH00)
  RHH(J)=RH00
  WRITE(61,22) XMS(J),XBB(J),XSI(J),RHH(J)
4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
22 FORMAT(/2X,5HMEAN=,F15.6,14H REG. COEF.=,F10.6,12H ST. DEV.=,F
115.6,15H CORR. COEF.=,F9.6/)
16 READ(60,1) LI
  IF(LI.EQ.0) GO TO 17
  WRITE(61,18) LI
18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
  CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22,XBB,XSI,RHH,XMS)
  GO TO 16
17 CALL EXIT
END

```

```

SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22,XBB,XSI,RHH,XMS
1)
C SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13),XMS(13)
DIMENSION X5(501),Y11(21,13),Y22(21,13),XBB(13),XSI(13),RHH(13)
IX=135
AM=0.0
S=1.0
I=1
X(I)=XMS(1)*XMS(1)
X11=X(I)
XSI(13)=XSI(1)
XMS(13)=XMS(1)
XMU(13)=XMU(1)
XSIG(13)=XSIG(1)
I1=0
S1=0.0
S2=X(I)/10000.
DO 2 K=1,L1
DO 2 J=1,NS
IF(J.EQ.2.OR.J.EQ.6.OR.J.EQ.7.OR.J.EQ.8.OR.J.EQ.12) GO TO 15
IF(J.EQ.5) GO TO 15
TERM1=B(J)*(X11-XMU(J))

```

```

CALL GAUSS(IX,IY,S,AM,Z)
IX=IY
TERM2=1-RHO(J)*RHO(J)
TERM3=Z*XSIG(J+1)*SQRT(TERM2)
X12=XMU(J+1)+TERM1+TERM3
GO TO 16
15 X11=SQRT(X11)
TER1=XBB(J)*(X11-XMS(J))
CALL GAUSS(IX,IY,S,AM,Z)
IX=IY
TER2=1-RHH(J)*RHH(J)
TER3=Z*XSI(J+1)*SQRT(TER2)
X12=(XMS(J+1)+TER1+TER3)*(XMS(J+1)+TER1+TER3)
16 CONTINUE
IF(X12) 6,10,10
6 WRITE(61,3) X12
S1=S1+X12
X12=0.0
I1=I1+1
10 X(I+1)=X12
S2=S2+X(I+1)/10000.0
X11=X12
I=I+1
2 CONTINUE
WRITE(61,9) S1,I1,S2
9 FORMAT(2X,22H SUM OF NEGATIVE VALUE=,F15.5,16H NO. OF N. V. =,I10,
118H TOTAL VOL 10**4=,F20.6)
WRITE(61,3) (X(J),J=1,I)
3 FORMAT(12F10.2)
KI=1
DO 5 J=1,NS
KK=1
SUM=0.0
DO 4 K=KI,I,12
X5(KK)=X(K)
KK=KK+1
4 SUM=SUM+X(K)
CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
KI=KI+1
DV=SUM/L1
CALL AGM22(VA,SIG,X5,L1,DV)
WRITE(61,15) VA,SIG
15 FORMAT(/2X,9HVARIANCE=,F20.6,17H STANDARD DEV.=,F20.6/)
5 WRITE(61,12) DV
12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
NN=NS
KK=1
DO 8 J=1,L1
SU=0.0
DO 7 K=KK,NN
7 SU=SU+X(K)
X5(J)=SU
KK=KK+NS
8 NN=NN+NS
WRITE(61,14)
14 FORMAT(/10X,21HANNUAL SYNTHETIC FLOW/)
WRITE(61,3) (X5(J),J=1,L1)
CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
RETURN
END

```

APPENDIX 8. SUBROUTINE PROGRAMS FOR AGM11, AGM12A, AGM22,  
AGM32, GAUSS, RANDD, FREQ AND XFREQ.

```

C   SUBROUTINE AGM11(X,N,XMU)
    TO COMPUTE THE MEAN VALUE OF DATA
    DIMENSION X(50)
    SUM=0.0
    DO 3 I=1,N
3   SUM=SUM+X(I)
    XN=N
    XMU=SUM/XN
    RETURN
    END

```

```

C   SUBROUTINE AG12A(B,X,X1,N,XMU,XM1)
C   COMPUTE THE SLOPE OF DATA
    R=SLOPE
    DIMENSION X(50),X1(50)
    SUMP=0.0
    SUMS=0.0
    DO 1 I=1,N
    SUMPI=X1(I)*X(I)
    SUMP=SUMP+SUMPI
    SUMSI=X(I)*X(I)
1   SUMS=SUMS+SUMSI
    XN=N
    B=(SUMP-XN*XM1*XMU)/(SUMS-XN*XMU*XMU)
    RETURN
    END

```

```

C   SUBROUTINE AGM22(VAR,SIGMA,X,N,XMU)
    COMPUTE VARIANCE AND STANDARD DEVIATION
    DIMENSION X(50)
    SUM=0.0
    DO 1 I=1,N
    DIFFS=(X(I)-XMU)*(X(I)-XMU)
1   SUM=SUM+DIFFS
    VAR=SUM/(N-1)
    SIGMA=SQRT(VAR)
    RETURN
    END

```

```

C   SUBROUTINE AGM32(SIGMA1,SIGMA2,N,X,X1,XMU,XM1,RHO)
    COMPUTE THE CORRELATION COEFFICIENTS
    DIMENSION X(50),X1(50)
    SUM=0.0
    K=N-1
    DO 1 I=1,K
    PROD=(X(I)-XMU)*(X1(I)-XM1)
1   SUM=SUM+PROD
    RHO=SUM/(K*SIGMA1*SIGMA2)
    RETURN
    END

```

```

C   SUBROUTINE GAUSS(IX,IY,S,AM,Z)
    COMPUTES A NORMALLY DISTRIBUTED RANDOM NUMBER WITH A GIVEN

```

```

C MEAN AND STANDARD DEVIATION
  A=0.0
  DO 1 I=1,12
  CALL RANDD(IX,IY,Y)
  IX=IY
1  A=A+Y
  Z=(A-6.0)*S+AM
  RETURN
  END

```

```

C SUBROUTINE RANDD(IX,IY,YFL)
  GENERATE THE RANDOM NUMBER
  IY=IX*4099
  IF(IY)5,6,6
5  IY=IY+8388607+1
6  YFL=IY
  YFL=YFL/8388607
  RETURN
  END

```

```

C SUBROUTINE FREQ(X,L,NN,YY,XN)
C COMPUTE THE FREQUENCY DISTRIBUTION
  X=INPUT DATA, L=LENTH OF INPUT DATA, NN=NO. OF FREQ. INTERVAL
  DIMENSION X(501),N(20),YY(21),XN(20),XNN(21)
  YMIN=1.0E30
  YMAX=-1.0E30
  DO 7 I=1,L
  IF(X(I)-YMIN) 9,10,10
9  YMIN=X(I)
10 IF(X(I)-YMAX) 7,7,11
11 YMAX=X(I)
  7 CONTINUE
  WRITE(61,12) YMAX,YMIN
12 FORMAT(2X,5HYMAX=,F15.4,8H YMIN=,F15.4)
  YMAMI=(YMAX-YMIN)/NN
  YY(1)=YMIN-0.0001
  DO 1 I=1,NN
  1 YY(I+1)=I*YMAMI+YMIN
  DO 2 I=1,NN
  2 N(I)=0
  DO 3 J=1,L
  DO 3 I=1,NN
  IF(X(J).LE.YY(I+1).AND.X(J).GT.YY(I)) N(I)=N(I)+1
  3 CONTINUE
  I=1
  FNSL=L
  XNN(I)=0.0
  DO 4 I=1,NN
  XN(I)=N(I)/FNSL
  4 XNN(I+1)=XNN(I)+XN(I)
  WRITE(61,13)
13 FORMAT(/2X,58HCLASS INTERVAL OBS. FREQ. PROB. FCN. CUM. PROB
  1. FCN./)
  DO 6 I=1,NN
  6 WRITE(61,5) YY(I+1),N(I),XN(I),XNN(I+1)
  5 FORMAT(F15.5,I10,2F15.5)
  RETURN
  END

```

```

SUBROUTINE XFREQ(X,L1,NN,Y1,Y2,J1,L)
CHI-SQUARE TEST FOR GOODNESS-OF-FIT
DIMENSION X(501),Y1(21,13),Y2(21,13),N(20),XN(20),XNN(21)
DO 2 I=1,NN
2 N(I)=0
DO 3 J=1,L1
IF(X(J).LE.Y1(1,J1)) N(1)=N(1)+1
IF(X(J).GT.Y1(NN+1,J1)) N(NN)=N(NN)+1
DO 3 I=1,NN
IF(X(J).LE.Y1(I+1,J1).AND.X(J).GT.Y1(I,J1)) N(I)=N(I)+1
3 CONTINUE
I=1
FNSL=L1
XNN(I)=0.0
DO 4 I=1,NN
XN(I)=N(I)/FNSL
4 XNN(I+1)=XNN(I)+XN(I)
WRITE(61,12)
12 FORMAT(/2X,58HCLASS INTERVAL   OBS.  FREQ.   PROB.  FCN.   CUM.  PROB
1.  FCN./)
DO 6 I=1,NN
6 WRITE(61,5) Y1(I+1,J1),N(I),XN(I),XNN(I+1)
5 FORMAT(F15.5,I10,2F15.5)
XSQ=0.0
DO 7 I=1,NN
IF(XN(I).EQ.0.0) GO TO 9
XSQ=XSQ+(((Y2(I,J1)-XN(I))*(Y2(I,J1)-XN(I)))/XN(I))*L
GO TO 7
9 XSQ=XSQ+Y2(I,J1)*L
7 CONTINUE
IF(J1.EQ.13) GO TO 10
WRITE(61,8) J1,XSQ
8 FORMAT(/2X,6HMONTH=,I4,14H   CHI-SQUARE=,F20.6/)
RETURN
10 WRITE(61,11) XSQ
11 FORMAT(/2X,18HANNUAL CHI-SQUARE=,F20.6/)
RETURN
END

```



ANNEX A: EXAMPLE OF COMPUTER OUTPUT

DATA OF MEAN MONTHLY STREAM FLOW KISSIMMEE RIVER

SYNTHETIC FLOW BASED ON THE NORMAL DISTRIBUTION

MEAN MONTHLY STREAMFLOW DATA. UNIT = CFS

| JAN.    | FEB.    | MAR.    | APR.    | MAY     | JUN.     | JUL.    | AUG.    | SEP.     | OCT.     | NOV.    | DEC.    | ANNUAL   |
|---------|---------|---------|---------|---------|----------|---------|---------|----------|----------|---------|---------|----------|
| 1826.00 | 1467.00 | 1158.00 | 883.00  | 681.00  | 768.00   | 1323.00 | 1560.00 | 2929.00  | 5344.00  | 3325.00 | 2529.00 | 23793.00 |
| 2019.00 | 1945.00 | 1984.00 | 2916.00 | 3379.00 | 10030.00 | 7775.00 | 4714.00 | 4250.00  | 4510.00  | 3360.00 | 2630.00 | 49512.00 |
| 2840.00 | 2770.00 | 3110.00 | 2830.00 | 2360.00 | 1670.00  | 1270.00 | 1140.00 | 1290.00  | 1170.00  | 1030.00 | 872.00  | 22352.00 |
| 737.00  | 598.00  | 502.00  | 381.00  | 328.00  | 802.00   | 549.00  | 851.00  | 2120.00  | 1270.00  | 1120.00 | 875.00  | 10133.00 |
| 720.00  | 612.00  | 545.00  | 550.00  | 384.00  | 341.00   | 998.00  | 2490.00 | 7740.00  | 5010.00  | 3040.00 | 2180.00 | 24610.00 |
| 1650.00 | 1420.00 | 1260.00 | 1300.00 | 1290.00 | 3970.00  | 7200.00 | 5180.00 | 4190.00  | 2949.00  | 2097.00 | 1494.00 | 34000.00 |
| 1185.00 | 939.00  | 706.00  | 575.00  | 431.00  | 314.00   | 462.00  | 524.00  | 1288.00  | 3000.00  | 1735.00 | 1349.00 | 12508.00 |
| 1234.00 | 1847.00 | 2929.00 | 2076.00 | 1516.00 | 1678.00  | 1760.00 | 1916.00 | 2123.00  | 2298.00  | 2135.00 | 1748.00 | 23260.00 |
| 1464.00 | 1346.00 | 1264.00 | 1396.00 | 1081.00 | 980.00   | 1005.00 | 957.00  | 1045.00  | 2339.00  | 2645.00 | 3522.00 | 19044.00 |
| 2148.00 | 1722.00 | 1364.00 | 999.00  | 674.00  | 761.00   | 1059.00 | 1544.00 | 1270.00  | 1356.00  | 1342.00 | 1005.00 | 15244.00 |
| 815.00  | 668.00  | 489.00  | 415.00  | 376.00  | 319.00   | 1018.00 | 1977.00 | 3535.00  | 3148.00  | 2397.00 | 1807.00 | 16964.00 |
| 1605.00 | 1497.00 | 1468.00 | 1496.00 | 1118.00 | 1042.00  | 1392.00 | 1783.00 | 2707.00  | 2654.00  | 1551.00 | 1219.00 | 19532.00 |
| 1496.00 | 1738.00 | 1556.00 | 1847.00 | 1908.00 | 1470.00  | 2878.00 | 3399.00 | 2440.00  | 2975.00  | 2916.00 | 2397.00 | 27020.00 |
| 2838.00 | 2592.00 | 3799.00 | 2534.00 | 1802.00 | 2616.00  | 2412.00 | 2227.00 | 2139.00  | 1783.00  | 1329.00 | 1098.00 | 27169.00 |
| 900.00  | 754.00  | 748.00  | 562.00  | 445.00  | 482.00   | 1025.00 | 1355.00 | 1719.00  | 3066.00  | 1722.00 | 1382.00 | 14160.00 |
| 1162.00 | 945.00  | 734.00  | 976.00  | 644.00  | 536.00   | 613.00  | 952.00  | 1237.00  | 1349.00  | 1741.00 | 1598.00 | 12487.00 |
| 1474.00 | 1320.00 | 1079.00 | 797.00  | 557.00  | 476.00   | 1809.00 | 3219.00 | 6155.00  | 6126.00  | 4378.00 | 3301.00 | 30691.00 |
| 2504.00 | 1835.00 | 1624.00 | 1170.00 | 998.00  | 1003.00  | 949.00  | 1340.00 | 2059.00  | 2168.00  | 1778.00 | 1521.00 | 18949.00 |
| 1269.00 | 1088.00 | 1589.00 | 1656.00 | 1301.00 | 2772.00  | 5223.00 | 5603.00 | 8975.00  | 9134.00  | 6240.00 | 4680.00 | 49530.00 |
| 4115.00 | 3836.00 | 2695.00 | 2093.00 | 1698.00 | 1406.00  | 1453.00 | 1683.00 | 5832.00  | 11500.00 | 5384.00 | 3549.00 | 45244.00 |
| 2436.00 | 1838.00 | 1310.00 | 943.00  | 683.00  | 596.00   | 977.00  | 1879.00 | 4839.00  | 6869.00  | 4128.00 | 2448.00 | 28946.00 |
| 1793.00 | 1520.00 | 1184.00 | 869.00  | 701.00  | 741.00   | 744.00  | 558.00  | 620.00   | 1427.00  | 1693.00 | 1147.00 | 12997.00 |
| 1080.00 | 1105.00 | 917.00  | 1452.00 | 1681.00 | 939.00   | 1510.00 | 1975.00 | 1581.00  | 3939.00  | 2733.00 | 2286.00 | 21198.00 |
| 1804.00 | 1527.00 | 1335.00 | 1394.00 | 1469.00 | 1580.00  | 1566.00 | 1716.00 | 1938.00  | 3579.00  | 3813.00 | 2397.00 | 24118.00 |
| 1827.00 | 1611.00 | 1466.00 | 1533.00 | 1485.00 | 1429.00  | 1658.00 | 2518.00 | 7463.00  | 11780.00 | 7678.00 | 6984.00 | 47432.00 |
| 5399.00 | 3715.00 | 2769.00 | 1941.00 | 1632.00 | 3424.00  | 3253.00 | 2344.00 | 2321.00  | 2619.00  | 1590.00 | 1616.00 | 32623.00 |
| 1336.00 | 1233.00 | 925.00  | 745.00  | 492.00  | 470.00   | 1130.00 | 1126.00 | 1124.00  | 802.00   | 547.00  | 467.00  | 10397.00 |
| 395.00  | 326.00  | 263.00  | 171.00  | 116.00  | 99.00    | 125.00  | 140.00  | 465.00   | 3398.00  | 2289.00 | 1375.00 | 9162.00  |
| 1151.00 | 1019.00 | 1402.00 | 1667.00 | 2229.00 | 1905.00  | 2461.00 | 3468.00 | 4554.00  | 4247.00  | 2671.00 | 1786.00 | 28560.00 |
| 2315.00 | 2959.00 | 3111.00 | 3097.00 | 2626.00 | 1951.00  | 2072.00 | 1915.00 | 1812.00  | 1330.00  | 834.00  | 710.00  | 24732.00 |
| 734.00  | 807.00  | 1712.00 | 2725.00 | 2233.00 | 4484.00  | 5897.00 | 5351.00 | 6128.00  | 8118.00  | 6688.00 | 4517.00 | 49394.00 |
| 3059.00 | 2983.00 | 3783.00 | 5992.00 | 3866.00 | 2850.00  | 3990.00 | 9293.00 | 11860.00 | 11480.00 | 7066.00 | 4249.00 | 70471.00 |
| 2891.00 | 2321.00 | 1834.00 | 1519.00 | 1037.00 | 772.00   | 937.00  | 1131.00 | 1068.00  | 537.00   | 378.00  | 283.00  | 14708.00 |
| 217.00  | 171.00  | 135.00  | 114.00  | 72.00   | 258.00   | 1122.00 | 1251.00 | 2830.00  | 1337.00  | 487.00  | 318.00  | 8312.00  |
| 277.00  | 423.00  | 849.00  | 510.00  | 404.00  | 536.00   | 565.00  | 460.00  | 610.00   | 715.00   | 541.00  | 604.00  | 6494.00  |
| 820.00  | 2135.00 | 2360.00 | 1590.00 | 1516.00 | 1428.00  | 651.00  | 971.00  | 2423.00  | 2539.00  | 839.00  | 395.00  | 17667.00 |
| 735.00  | 943.00  | 1705.00 | 1147.00 | 449.00  | 405.00   | 1031.00 | 1880.00 | 1983.00  | 2056.00  | 1615.00 | 656.00  | 14605.00 |
| 1040.00 | 2206.00 | 3994.00 | 2903.00 | 1769.00 | 1909.00  | 1963.00 | 3321.00 | 2700.00  | 2765.00  | 907.00  | 246.00  | 25723.00 |
| 195.00  | 259.00  | 171.00  | 102.00  | 389.00  | 493.00   | 540.00  | 1700.00 | 2451.00  | 1670.00  | 260.00  | 250.00  | 8480.00  |
| 230.00  | 200.00  | 170.00  | 102.00  | 196.00  | 3500.00  | 6750.00 | 3730.00 | 2980.00  | 2280.00  | 790.00  | 350.00  | 21278.00 |
| 1458.00 | 512.00  | 3563.00 | 2771.00 | 1737.00 | 1626.00  | 367.00  | 1417.00 | 1999.00  | 10600.00 | 2972.00 | 3712.00 | 32134.00 |
| 4390.00 | 2748.00 | 3535.00 | 2664.00 | 326.00  | 389.00   | 794.00  | 334.00  | 189.00   | 501.00   | 122.00  | 254.00  | 16246.00 |
| 803.00  | 2408.00 | 333.00  | 13.00   | 3.00    | 362.00   | 748.00  | 721.00  | 1584.00  | 929.00   | 186.00  | 62.00   | 8152.00  |
| 18.00   | 208.00  | 83.00   | 387.00  | 729.00  | 2064.00  | 1412.00 | 476.00  | 514.00   | 36.00    | 109.00  | 188.00  | 6224.00  |
| 583.00  | 1928.00 | 1931.00 | 3525.00 | 2150.00 | 583.00   | 1310.00 | 2678.00 | 4217.00  | 1210.00  | 163.00  | 68.00   | 20346.00 |

MEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY

| JAN.    | FEB.    | MAR.    | APR.    | MAY     | JUN.    | JUL.    | AUG.    | SEP.    | OCT.     | NOV.    | DEC.    | ANNUAL   |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|---------|----------|
| 3621.82 | 2909.75 | 2296.86 | 1751.40 | 1350.74 | 1523.31 | 2624.13 | 3094.21 | 5809.59 | 10599.67 | 6595.04 | 5016.20 | 47192.73 |

|          |         |         |          |         |          |          |          |          |          |          |          |          |
|----------|---------|---------|----------|---------|----------|----------|----------|----------|----------|----------|----------|----------|
| 4004.63  | 3857.85 | 3935.21 | 5783.80  | 6702.15 | 19894.21 | 15421.49 | 9350.08  | 8429.75  | 8945.45  | 6664.46  | 5216.53  | 98205.62 |
| 5633.06  | 5494.21 | 6168.59 | 5613.22  | 4680.99 | 3312.40  | 2519.01  | 2261.16  | 2558.68  | 2320.66  | 2042.98  | 1729.59  | 44334.54 |
| 1461.82  | 1186.12 | 995.70  | 755.70   | 650.58  | 1590.74  | 1088.93  | 1687.93  | 4204.96  | 2519.01  | 2221.49  | 1735.54  | 20098.51 |
| 1428.10  | 1213.88 | 1080.99 | 1090.91  | 761.65  | 676.36   | 1979.50  | 4938.84  | 15352.07 | 9937.19  | 6029.75  | 4323.97  | 48813.22 |
| 3272.73  | 2816.53 | 2499.17 | 2578.51  | 2558.68 | 7874.38  | 14280.99 | 10274.38 | 8310.74  | 5849.26  | 4159.34  | 2963.31  | 67438.01 |
| 2350.41  | 1862.48 | 1400.33 | 1140.50  | 854.88  | 622.81   | 916.36   | 1039.34  | 2554.71  | 5950.41  | 3441.32  | 2675.70  | 24809.26 |
| 2447.60  | 3663.47 | 5809.59 | 4117.69  | 3006.94 | 3328.26  | 3490.91  | 3800.33  | 4210.91  | 4558.02  | 4234.71  | 3467.11  | 46135.54 |
| 2903.80  | 2669.75 | 2507.11 | 2768.93  | 2144.13 | 1943.80  | 1993.39  | 1898.18  | 2072.73  | 4639.34  | 5246.28  | 6985.78  | 37773.22 |
| 4260.50  | 3415.54 | 2705.45 | 1981.49  | 1336.86 | 1509.42  | 2100.50  | 3062.48  | 2519.01  | 2689.59  | 2661.82  | 1993.39  | 30236.03 |
| 1616.53  | 1324.96 | 969.92  | 823.14   | 745.79  | 632.73   | 2019.17  | 3921.32  | 7011.57  | 6243.97  | 4754.38  | 3584.13  | 33647.60 |
| 3183.47  | 2969.26 | 2911.74 | 2967.27  | 2217.52 | 2066.78  | 2760.99  | 3536.53  | 5369.26  | 5264.13  | 3076.36  | 2417.85  | 38741.16 |
| 2967.27  | 3447.27 | 3086.28 | 3663.47  | 3784.46 | 2915.70  | 5708.43  | 6741.82  | 4839.67  | 5900.83  | 5783.80  | 4754.38  | 53593.39 |
| 5629.09  | 5141.16 | 7535.21 | 5026.12  | 3574.21 | 5188.76  | 4784.13  | 4417.19  | 4242.64  | 3536.53  | 2636.03  | 2177.85  | 53888.92 |
| 1785.12  | 1495.54 | 1483.64 | 1114.71  | 882.64  | 956.03   | 2033.06  | 2687.60  | 3409.59  | 6081.32  | 3415.54  | 2741.16  | 28085.95 |
| 2304.79  | 1874.38 | 1455.87 | 1935.87  | 1277.36 | 1063.14  | 1215.87  | 1888.26  | 2453.55  | 2675.70  | 3453.22  | 3169.59  | 24767.60 |
| 2923.64  | 2618.18 | 2140.17 | 1580.83  | 1104.79 | 944.13   | 3588.10  | 6384.79  | 12208.26 | 12150.74 | 8683.64  | 6547.44  | 60874.71 |
| 4966.61  | 3639.67 | 3221.16 | 2320.66  | 1979.50 | 1989.42  | 1882.31  | 2657.85  | 4083.97  | 4300.17  | 3526.61  | 3016.86  | 37584.79 |
| 2517.02  | 2158.02 | 3151.74 | 3284.63  | 2580.50 | 5498.18  | 10359.67 | 11113.39 | 17801.65 | 18117.02 | 12376.86 | 9282.64  | 98241.32 |
| 8161.98  | 7608.59 | 5345.45 | 4151.40  | 3367.93 | 2788.76  | 2881.98  | 3338.18  | 11567.60 | 22809.92 | 10679.01 | 7039.34  | 89740.16 |
| 4831.74  | 3645.62 | 2598.35 | 1870.41  | 1354.71 | 1182.15  | 1937.85  | 3726.94  | 9598.02  | 13624.46 | 8187.77  | 4855.54  | 57413.55 |
| 3556.36  | 3014.88 | 2348.43 | 1723.64  | 1390.41 | 1469.75  | 1475.70  | 1106.78  | 1229.75  | 2830.41  | 3358.02  | 2275.04  | 25779.17 |
| 2142.15  | 2191.74 | 1818.84 | 2880.00  | 3334.21 | 1862.48  | 2995.04  | 3917.36  | 3135.87  | 7812.89  | 5420.83  | 4534.21  | 42045.62 |
| 3578.18  | 3028.76 | 2647.93 | 2764.96  | 2913.72 | 3133.88  | 3106.12  | 3403.64  | 3843.97  | 7098.84  | 7562.97  | 4754.38  | 47837.35 |
| 3623.80  | 3195.37 | 2907.77 | 3040.66  | 2945.45 | 2834.38  | 3288.59  | 4994.38  | 14802.64 | 23365.29 | 15229.09 | 13852.56 | 94080.00 |
| 10708.76 | 7368.59 | 5492.23 | 3849.92  | 3237.02 | 6791.40  | 6452.23  | 4649.26  | 4603.64  | 5194.71  | 3153.72  | 3205.29  | 64706.77 |
| 2649.92  | 2445.62 | 1834.71 | 1477.69  | 975.87  | 932.23   | 2241.32  | 2233.39  | 2229.42  | 1590.74  | 1084.96  | 926.28   | 20622.15 |
| 783.47   | 646.61  | 521.65  | 339.17   | 230.08  | 196.36   | 247.93   | 277.69   | 922.31   | 6739.83  | 4540.17  | 2727.27  | 18172.56 |
| 2282.98  | 2021.16 | 2780.83 | 3306.45  | 4421.16 | 3778.51  | 4881.32  | 6878.68  | 9032.73  | 8423.80  | 5297.85  | 3542.48  | 56647.93 |
| 4591.74  | 5869.09 | 6170.58 | 6142.81  | 5208.59 | 3869.75  | 4109.75  | 3798.35  | 3594.05  | 2638.02  | 1654.21  | 1408.26  | 49055.20 |
| 1455.87  | 1600.66 | 3395.70 | 5404.96  | 4429.09 | 8893.88  | 11696.53 | 10613.55 | 12154.71 | 16101.82 | 13265.45 | 8959.34  | 97971.57 |
| 6067.44  | 5916.69 | 7503.47 | 11884.96 | 7668.10 | 5652.89  | 7914.05  | 18432.40 | 23523.97 | 22770.25 | 14015.21 | 8427.771 | 39777.18 |
| 5734.21  | 4603.64 | 3637.69 | 3012.89  | 2056.86 | 1531.24  | 1858.51  | 2243.31  | 2118.35  | 1065.12  | 749.75   | 561.32   | 29172.89 |
| 430.41   | 339.17  | 267.77  | 226.12   | 142.81  | 511.74   | 2225.45  | 2481.32  | 5613.22  | 2651.90  | 965.95   | 630.74   | 16486.61 |
| 549.42   | 839.01  | 1683.97 | 1011.57  | 801.32  | 1063.14  | 1120.66  | 912.40   | 1209.92  | 1418.18  | 1073.06  | 1198.02  | 12880.66 |
| 1626.45  | 4234.71 | 4680.99 | 3153.72  | 3006.94 | 2832.40  | 1291.24  | 1925.95  | 4805.95  | 5036.03  | 1664.13  | 783.47   | 35041.98 |
| 1457.85  | 1870.41 | 3381.82 | 2275.04  | 890.58  | 803.31   | 2044.96  | 3728.93  | 3933.22  | 4078.02  | 3203.31  | 1301.16  | 28968.59 |
| 2062.81  | 4375.54 | 7921.98 | 5758.02  | 3508.76 | 3786.45  | 3893.55  | 6587.11  | 5355.37  | 5484.30  | 1799.01  | 487.93   | 51020.82 |
| 386.78   | 513.72  | 339.17  | 202.31   | 771.57  | 977.85   | 1071.07  | 3371.90  | 4861.49  | 3312.40  | 515.70   | 495.87   | 16819.83 |
| 456.20   | 396.69  | 337.19  | 202.31   | 388.76  | 6942.15  | 13388.43 | 7398.35  | 5910.74  | 4522.31  | 1566.94  | 694.21   | 42204.30 |
| 2891.90  | 1015.54 | 7067.11 | 5496.20  | 3445.29 | 3225.12  | 727.93   | 2810.58  | 3964.96  | 19834.71 | 5894.88  | 7362.64  | 63736.86 |
| 8707.44  | 5450.58 | 7011.57 | 5283.97  | 646.61  | 771.57   | 1574.88  | 662.48   | 374.88   | 993.72   | 241.98   | 503.80   | 32223.47 |
| 1592.73  | 4776.20 | 660.50  | 25.79    | 5.95    | 718.02   | 1483.64  | 1430.08  | 3141.82  | 1842.64  | 368.93   | 122.98   | 16169.26 |
| 35.70    | 412.56  | 164.63  | 767.60   | 1445.95 | 4093.88  | 2800.66  | 944.13   | 1019.50  | 71.40    | 216.20   | 372.89   | 12345.12 |
| 1156.36  | 3824.13 | 3830.08 | 6991.74  | 4264.46 | 1156.36  | 2598.35  | 5311.74  | 8364.30  | 2400.00  | 323.31   | 134.88   | 40355.70 |

ANNUAL FREQUENCY DISTRIBUTION

YMAX= 139777.1848 YMIN= 12345.1235

CLASS INTERVAL OBS. FREQ. PROB. FCN. CUM. PROB. FCN.

|             |   |        |        |
|-------------|---|--------|--------|
| 18716.72657 | 6 | .13333 | .13333 |
| 25088.32964 | 4 | .08889 | .22222 |
| 31459.93270 | 5 | .11111 | .33333 |
| 37831.53577 | 5 | .11111 | .44444 |
| 44203.13884 | 4 | .08889 | .53333 |
| 50574.74191 | 6 | .13333 | .66667 |
| 56946.34497 | 4 | .08889 | .75556 |
| 63317.94804 | 2 | .04444 | .80000 |
| 69689.55111 | 3 | .06667 | .86667 |
| 76061.15417 | 0 | 0      | .86667 |

|              |   |        |         |
|--------------|---|--------|---------|
| 82432.75724  | 0 | 0      | .86667  |
| 88804.36031  | 0 | 0      | .86667  |
| 95175.96337  | 2 | .04444 | .91111  |
| 101547.56644 | 3 | .06667 | .97778  |
| 107919.16951 | 0 | 0      | .97778  |
| 114290.77258 | 0 | 0      | .97778  |
| 120662.37564 | 0 | 0      | .97778  |
| 127033.97871 | 0 | 0      | .97778  |
| 133405.58178 | 0 | 0      | .97778  |
| 139777.18484 | 1 | .02222 | 1.00000 |

MONTH= 1 FREQUENCY DISTRIBUTION

YMAX= 10708.7599 YMIN= 35.7025

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 569.35535      | 5          | .11111     | .11111          |
| 1103.00822     | 1          | .02222     | .13333          |
| 1636.66110     | 8          | .17778     | .31111          |
| 2170.31397     | 3          | .06667     | .37778          |
| 2703.96684     | 6          | .13333     | .51111          |
| 3237.61971     | 5          | .11111     | .62222          |
| 3771.27259     | 5          | .11111     | .73333          |
| 4304.92546     | 2          | .04444     | .77778          |
| 4838.57833     | 2          | .04444     | .82222          |
| 5372.23120     | 1          | .02222     | .84444          |
| 5905.88408     | 3          | .06667     | .91111          |
| 6439.53695     | 1          | .02222     | .93333          |
| 6973.18982     | 0          | 0          | .93333          |
| 7506.84269     | 0          | 0          | .93333          |
| 8040.49557     | 0          | 0          | .93333          |
| 8574.14844     | 1          | .02222     | .95556          |
| 9107.80131     | 1          | .02222     | .97778          |
| 9641.45418     | 0          | 0          | .97778          |
| 10175.10706    | 0          | 0          | .97778          |
| 10708.75993    | 1          | .02222     | 1.00000         |

MEAN= 3128.903464 REG. COEF.= .679379 ST. DEV.= 2266.838545 CORR. COEF.= .850733

MONTH= 2 FREQUENCY DISTRIBUTION

YMAX= 7608.5948 YMIN= 339.1735

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 702.64460      | 5          | .11111     | .11111          |
| 1066.11566     | 2          | .04444     | .15556          |
| 1429.58672     | 3          | .06667     | .22222          |
| 1793.05778     | 2          | .04444     | .26667          |
| 2156.52884     | 4          | .08889     | .35556          |
| 2519.99991     | 3          | .06667     | .42222          |
| 2883.47097     | 3          | .06667     | .48889          |
| 3246.94203     | 5          | .11111     | .60000          |
| 3610.41309     | 2          | .04444     | .64444          |
| 3973.88415     | 5          | .11111     | .75556          |
| 4337.35521     | 1          | .02222     | .77778          |
| 4700.82627     | 2          | .04444     | .82222          |
| 5064.29733     | 1          | .02222     | .84444          |

|            |   |        |         |
|------------|---|--------|---------|
| 5427.76839 | 1 | .02222 | .86667  |
| 5791.23945 | 2 | .04444 | .91111  |
| 6154.71051 | 2 | .04444 | .95556  |
| 6518.18157 | 0 | 0      | .95556  |
| 6881.65263 | 0 | 0      | .95556  |
| 7245.12370 | 0 | 0      | .95556  |
| 7608.59476 | 2 | .04444 | 1.00000 |

MEAN= 2999.184460 REG. COEF.= .859816 ST. DEV.= 1829.430398 CORR. COEF.= .718502

MONTH= 3 FREQUENCY DISTRIBUTION

YMAX= 7921.9832 YMIN= 164.6281

CLASS INTERVAL OBS. FREQ. PROB. FCN. CUM. PROB. FCN.

|            |   |        |         |
|------------|---|--------|---------|
| 552.49585  | 5 | .11111 | .11111  |
| 940.36360  | 1 | .02222 | .13333  |
| 1328.23136 | 3 | .06667 | .20000  |
| 1716.09911 | 4 | .08889 | .28889  |
| 2103.96686 | 2 | .04444 | .33333  |
| 2491.83462 | 3 | .06667 | .40000  |
| 2879.70237 | 6 | .13333 | .53333  |
| 3267.57013 | 5 | .11111 | .64444  |
| 3655.43788 | 3 | .06667 | .71111  |
| 4043.30563 | 2 | .04444 | .75556  |
| 4431.17339 | 0 | 0      | .75556  |
| 4819.04114 | 1 | .02222 | .77778  |
| 5206.90890 | 0 | 0      | .77778  |
| 5594.77665 | 2 | .04444 | .82222  |
| 5982.64440 | 1 | .02222 | .84444  |
| 6370.51216 | 2 | .04444 | .88889  |
| 6758.37991 | 0 | 0      | .88889  |
| 7146.24767 | 2 | .04444 | .93333  |
| 7534.11542 | 1 | .02222 | .95556  |
| 7921.98317 | 2 | .04444 | 1.00000 |

MEAN= 3149.002637 REG. COEF.= .891276 ST. DEV.= 2179.523702 CORR. COEF.= .831620

MONTH= 4 FREQUENCY DISTRIBUTION

YMAX= 11884.9582 YMIN= 25.7851

CLASS INTERVAL OBS. FREQ. PROB. FCN. CUM. PROB. FCN.

|            |   |        |        |
|------------|---|--------|--------|
| 618.74378  | 5 | .11111 | .11111 |
| 1211.70243 | 7 | .15556 | .26667 |
| 1804.66109 | 4 | .08889 | .35556 |
| 2397.61974 | 5 | .11111 | .46667 |
| 2990.57840 | 5 | .11111 | .57778 |
| 3583.53706 | 5 | .11111 | .68889 |
| 4176.49571 | 4 | .08889 | .77778 |
| 4769.45437 | 0 | 0      | .77778 |
| 5362.41302 | 2 | .04444 | .82222 |
| 5955.37168 | 5 | .11111 | .93333 |
| 6548.33033 | 1 | .02222 | .95556 |
| 7141.28899 | 1 | .02222 | .97778 |
| 7734.24764 | 0 | 0      | .97778 |

|             |   |        |         |
|-------------|---|--------|---------|
| 8327.20630  | 0 | 0      | .97778  |
| 8920.16495  | 0 | 0      | .97778  |
| 9513.12361  | 0 | 0      | .97778  |
| 10106.08227 | 0 | 0      | .97778  |
| 10699.04092 | 0 | 0      | .97778  |
| 11291.99958 | 0 | 0      | .97778  |
| 11884.95823 | 1 | .02222 | 1.00000 |

MEAN= 2967.625233 REG. COEF.= .670577 ST. DEV.= 2301.503271 CORR. COEF.= .839654

MONTH= 5 FREQUENCY DISTRIBUTION

YMAX= 7668.0989 YMIN= 5.9504

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 389.05784      | 4          | .08889     | .08889          |
| 772.16526      | 5          | .11111     | .20000          |
| 1155.27268     | 6          | .13333     | .33333          |
| 1538.38011     | 6          | .13333     | .46667          |
| 1921.48753     | 0          | 0          | .46667          |
| 2304.59495     | 4          | .08889     | .55556          |
| 2687.70238     | 2          | .04444     | .60000          |
| 3070.80980     | 4          | .08889     | .68889          |
| 3453.91723     | 4          | .08889     | .77778          |
| 3837.02465     | 3          | .06667     | .84444          |
| 4220.13207     | 0          | 0          | .84444          |
| 4603.23950     | 3          | .06667     | .91111          |
| 4986.34692     | 1          | .02222     | .93333          |
| 5369.45434     | 1          | .02222     | .95556          |
| 5752.56177     | 0          | 0          | .95556          |
| 6135.66919     | 0          | 0          | .95556          |
| 6518.77661     | 0          | 0          | .95556          |
| 6901.88404     | 1          | .02222     | .97778          |
| 7284.99146     | 0          | 0          | .97778          |
| 7668.09889     | 1          | .02222     | 1.00000         |

MEAN= 2334.369059 REG. COEF.= 1.200746 ST. DEV.= 1746.715609 CORR. COEF.= .644186

MONTH= 6 FREQUENCY DISTRIBUTION

YMAX= 19894.2141 YMIN= 196.3636

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1181.25615     | 15         | .33333     | .33333          |
| 2166.14868     | 10         | .22222     | .55556          |
| 3151.04120     | 5          | .11111     | .66667          |
| 4135.93373     | 7          | .15556     | .82222          |
| 5120.82625     | 0          | 0          | .82222          |
| 6105.71878     | 3          | .06667     | .88889          |
| 7090.61130     | 2          | .04444     | .93333          |
| 8075.50383     | 1          | .02222     | .95556          |
| 9060.39635     | 1          | .02222     | .97778          |
| 10045.28888    | 0          | 0          | .97778          |
| 11030.18140    | 0          | 0          | .97778          |
| 12015.07393    | 0          | 0          | .97778          |
| 12999.96645    | 0          | 0          | .97778          |

|             |   |        |         |
|-------------|---|--------|---------|
| 13984.85898 | 0 | 0      | .97778  |
| 14969.75150 | 0 | 0      | .97778  |
| 15954.64403 | 0 | 0      | .97778  |
| 16939.53655 | 0 | 0      | .97778  |
| 17924.42908 | 0 | 0      | .97778  |
| 18909.32160 | 0 | 0      | .97778  |
| 19894.21413 | 1 | .02222 | 1.00000 |

MEAN= 3007.338730 REG. COEF.= .949508 ST. DEV.= 3127.989464 CORR. COEF.= .854044

MONTH= 7 FREQUENCY DISTRIBUTION

YMAX= 15421.4870 YMIN= 247.9339

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1006.61153     | 3          | .06667     | .06667          |
| 1765.28919     | 8          | .17778     | .24444          |
| 2523.96685     | 12         | .26667     | .51111          |
| 3282.64451     | 7          | .15556     | .66667          |
| 4041.32216     | 4          | .08889     | .75556          |
| 4799.99982     | 2          | .04444     | .80000          |
| 5558.67748     | 1          | .02222     | .82222          |
| 6317.35514     | 1          | .02222     | .84444          |
| 7076.03279     | 1          | .02222     | .86667          |
| 7834.71045     | 0          | 0          | .86667          |
| 8593.38811     | 1          | .02222     | .88889          |
| 9352.06577     | 0          | 0          | .88889          |
| 10110.74342    | 0          | 0          | .88889          |
| 10869.42108    | 1          | .02222     | .91111          |
| 11628.09874    | 0          | 0          | .91111          |
| 12386.77640    | 1          | .02222     | .93333          |
| 13145.45405    | 0          | 0          | .93333          |
| 13904.13171    | 1          | .02222     | .95556          |
| 14662.80937    | 1          | .02222     | .97778          |
| 15421.48703    | 1          | .02222     | 1.00000         |

MEAN= 3779.437875 REG. COEF.= .713552 ST. DEV.= 3682.506341 CORR. COEF.= .768547

MONTH= 8 FREQUENCY DISTRIBUTION

YMAX= 18432.3960 YMIN= 277.6859

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1185.42144     | 6          | .13333     | .13333          |
| 2093.15695     | 5          | .11111     | .24444          |
| 3000.89245     | 7          | .15556     | .40000          |
| 3908.62795     | 10         | .22222     | .62222          |
| 4816.36346     | 4          | .08889     | .71111          |
| 5724.09896     | 3          | .06667     | .77778          |
| 6631.83446     | 2          | .04444     | .82222          |
| 7539.56997     | 3          | .06667     | .88889          |
| 8447.30547     | 0          | 0          | .88889          |
| 9355.04097     | 1          | .02222     | .91111          |
| 10262.77647    | 0          | 0          | .91111          |
| 11170.51198    | 3          | .06667     | .97778          |
| 12078.24748    | 0          | 0          | .97778          |

|             |   |        |         |
|-------------|---|--------|---------|
| 12985.98298 | 0 | 0      | .97778  |
| 13893.71849 | 0 | 0      | .97778  |
| 14801.45399 | 0 | 0      | .97778  |
| 15709.18949 | 0 | 0      | .97778  |
| 16616.92500 | 0 | 0      | .97778  |
| 17524.66050 | 0 | 0      | .97778  |
| 18432.39600 | 1 | .02222 | 1.00000 |

MEAN= 4265.211961 REG. COEF.= 1.150804 ST. DEV.= 3428.921395 CORR. COEF.= .807501

MONTH= 9 FREQUENCY DISTRIBUTION

YMAX= 23523.9661 YMIN= 374.8760

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1532.33052     | 5          | .11111     | .11111          |
| 2689.78502     | 7          | .15556     | .26667          |
| 3847.23953     | 5          | .11111     | .37778          |
| 5004.69403     | 10         | .22222     | .60000          |
| 6162.14853     | 5          | .11111     | .71111          |
| 7319.60303     | 1          | .02222     | .73333          |
| 8477.05753     | 3          | .06667     | .80000          |
| 9634.51204     | 2          | .04444     | .84444          |
| 10791.96654    | 0          | 0          | .84444          |
| 11949.42104    | 1          | .02222     | .86667          |
| 13106.87554    | 2          | .04444     | .91111          |
| 14264.33004    | 0          | 0          | .91111          |
| 15421.78455    | 2          | .04444     | .95556          |
| 16579.23905    | 0          | 0          | .95556          |
| 17736.69355    | 0          | 0          | .95556          |
| 18894.14805    | 1          | .02222     | .97778          |
| 20051.60255    | 0          | 0          | .97778          |
| 21209.05706    | 0          | 0          | .97778          |
| 22366.51156    | 0          | 0          | .97778          |
| 23523.96606    | 1          | .02222     | 1.00000         |

MEAN= 5963.459832 REG. COEF.= .993432 ST. DEV.= 4866.076965 CORR. COEF.= .791945

MONTH= 10 FREQUENCY DISTRIBUTION

YMAX= 23365.2884 YMIN= 71.4050

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1236.09913     | 3          | .06667     | .06667          |
| 2400.79330     | 5          | .11111     | .17778          |
| 3565.48747     | 8          | .17778     | .35556          |
| 4730.18164     | 5          | .11111     | .46667          |
| 5894.87581     | 5          | .11111     | .57778          |
| 7059.56998     | 5          | .11111     | .68889          |
| 8224.26415     | 2          | .04444     | .73333          |
| 9388.95833     | 2          | .04444     | .77778          |
| 10553.65250    | 1          | .02222     | .80000          |
| 11718.34667    | 1          | .02222     | .82222          |
| 12883.04084    | 1          | .02222     | .84444          |
| 14047.73501    | 1          | .02222     | .86667          |
| 15212.42918    | 0          | 0          | .86667          |



|             |   |        |         |
|-------------|---|--------|---------|
| 16377.12335 | 1 | .02222 | .88889  |
| 17541.81752 | 0 | 0      | .88889  |
| 18706.51170 | 1 | .02222 | .91111  |
| 19871.20587 | 1 | .02222 | .93333  |
| 21035.90004 | 0 | 0      | .93333  |
| 22200.59421 | 0 | 0      | .93333  |
| 23365.28838 | 3 | .06667 | 1.00000 |

MEAN= 7022.016265 REG. COEF.= .563941 ST. DEV.= 6169.552979 CORR. COEF.= .894548

MONTH= 11 FREQUENCY DISTRIBUTION

YMAX= 15229.0903 YMIN= 216.1983

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 966.84294      | 7          | .15556     | .15556          |
| 1717.48754     | 5          | .11111     | .26667          |
| 2468.13214     | 3          | .06667     | .33333          |
| 3218.77674     | 5          | .11111     | .44444          |
| 3969.42134     | 5          | .11111     | .55556          |
| 4720.06594     | 3          | .06667     | .62222          |
| 5470.71054     | 4          | .08889     | .71111          |
| 6221.35514     | 3          | .06667     | .77778          |
| 6971.99974     | 2          | .04444     | .82222          |
| 7722.64434     | 1          | .02222     | .84444          |
| 8473.28894     | 1          | .02222     | .86667          |
| 9223.93354     | 1          | .02222     | .88889          |
| 9974.57814     | 0          | 0          | .88889          |
| 10725.22274    | 1          | .02222     | .91111          |
| 11475.86734    | 0          | 0          | .91111          |
| 12226.51194    | 0          | 0          | .91111          |
| 12977.15654    | 1          | .02222     | .93333          |
| 13727.80114    | 1          | .02222     | .95556          |
| 14478.44574    | 1          | .02222     | .97778          |
| 15229.09034    | 0          | 0          | .97778          |

MEAN= 4511.911676 REG. COEF.= .736088 ST. DEV.= 3809.687283 CORR. COEF.= .921534

MONTH= 12 FREQUENCY DISTRIBUTION

YMAX= 13852.5615 YMIN= 122.9752

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 809.45452      | 10         | .22222     | .22222          |
| 1495.93383     | 4          | .08889     | .31111          |
| 2182.41314     | 4          | .08889     | .40000          |
| 2868.89245     | 5          | .11111     | .51111          |
| 3555.37177     | 6          | .13333     | .64444          |
| 4241.85108     | 1          | .02222     | .66667          |
| 4928.33039     | 5          | .11111     | .77778          |
| 5614.80971     | 2          | .04444     | .82222          |
| 6301.28902     | 0          | 0          | .82222          |
| 6987.76833     | 2          | .04444     | .86667          |
| 7674.24765     | 2          | .04444     | .91111          |
| 8360.72696     | 0          | 0          | .91111          |
| 9047.20627     | 2          | .04444     | .95556          |

|             |   |        |        |
|-------------|---|--------|--------|
| 9733.68559  | 1 | .02222 | .97778 |
| 10420.16490 | 0 | 0      | .97778 |
| 11106.64421 | 0 | 0      | .97778 |
| 11793.12352 | 0 | 0      | .97778 |
| 12479.60284 | 0 | 0      | .97778 |
| 13166.08215 | 0 | 0      | .97778 |
| 13852.56146 | 0 | 0      | .97778 |

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MEAN= 3443.481965 REG. COEF.= .140510 ST. DEV.= 2953.324282 CORR. COEF.= .160906

SUM OF NEGATIVE VALUE= -57533.11405 NO. OF N. V. = 48 TOTAL VOL 10\*\*4= 214.003578

| JAN.    | FEB.    | MAR.    | APR.    | MAY     | JUN.    | JUL.     | AUG.     | SEP.     | OCT.     | NOV.     | DEC.    |
|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|---------|
| 3128.90 | 2449.69 | 3187.86 | 3542.89 | 4818.53 | 5005.43 | 4820.24  | 7725.86  | 8280.79  | 13157.65 | 9606.77  | 6555.78 |
| 3125.91 | 3382.57 | 2100.85 | 2379.10 | 2557.87 | 2121.51 | 620.56   | 363.47   | 0        | 3534.31  | 0        | 0       |
| 5037.80 | 4586.17 | 6986.75 | 7937.93 | 6137.31 | 9222.77 | 11373.64 | 10015.03 | 6574.30  | 10518.34 | 5721.90  | 4621.56 |
| 3378.67 | 3694.80 | 1105.55 | 0       | 1064.49 | 14.71   | 2080.95  | 6173.74  | 12495.55 | 7694.96  | 5620.40  | 3899.16 |
| 4556.95 | 3437.06 | 1679.76 | 328.77  | 777.79  | 3675.06 | 4324.64  | 4503.14  | 4586.47  | 11937.01 | 8314.53  | 5226.88 |
| 3873.96 | 4390.21 | 4517.56 | 6033.80 | 4812.52 | 5605.91 | 6122.14  | 4063.01  | 3616.25  | 0        | 3347.98  | 3219.65 |
| 3330.52 | 2651.25 | 2503.91 | 1528.14 | 2342.21 | 4.63    | 3092.15  | 1680.41  | 3290.93  | 7717.19  | 4513.05  | 5439.80 |
| 5263.49 | 4710.80 | 5066.42 | 4756.89 | 3697.94 | 5786.35 | 4107.18  | 2515.71  | 6725.41  | 2043.30  | 922.14   | 1860.33 |
| 3243.96 | 2204.63 | 1662.89 | 444.15  | 0       | 0       | 0        | 0        | 5311.00  | 7278.57  | 6227.95  | 4335.22 |
| 1790.46 | 2020.02 | 47.26   | 132.19  | 2035.86 | 918.30  | 2550.58  | 3250.13  | 10390.50 | 15240.11 | 8573.58  | 3930.08 |
| 6428.81 | 5739.58 | 3364.06 | 3337.15 | 991.37  | 1631.10 | 2950.56  | 1887.69  | 5582.63  | 8420.44  | 5032.25  | 2853.72 |
| 0       | 1688.26 | 35.10   | 996.49  | 2189.15 | 0       | 1090.44  | 1571.04  | 5762.48  | 3258.82  | 1520.50  | 0       |
| 2069.64 | 3090.57 | 4651.79 | 4916.67 | 5254.71 | 4542.15 | 3637.68  | 4954.91  | 10447.77 | 10472.73 | 9364.07  | 7653.78 |
| 5488.36 | 4268.05 | 5035.84 | 5882.13 | 5625.37 | 8621.30 | 10217.80 | 9455.63  | 6930.15  | 1529.34  | 2008.98  | 1453.60 |
| 1991.04 | 972.51  | 0       | 579.34  | 0       | 601.07  | 5311.39  | 4237.13  | 0        | 8081.36  | 7685.25  | 4441.25 |
| 2066.36 | 2740.36 | 2237.19 | 863.03  | 0       | 2382.45 | 4203.95  | 6175.80  | 10726.73 | 4197.40  | 4067.13  | 2211.84 |
| 0       | 1666.59 | 2698.59 | 1207.49 | 1910.87 | 1378.78 | 5816.59  | 4776.12  | 11136.34 | 13939.72 | 10003.63 | 7543.57 |
| 1531.89 | 916.04  | 0       | 0       | 595.99  | 0       | 1795.39  | 1904.45  | 10702.92 | 11191.06 | 5153.62  | 2881.35 |
| 1748.79 | 2102.32 | 3759.12 | 1705.83 | 2732.46 | 7482.86 | 9538.60  | 4680.50  | 810.37   | 6219.94  | 6534.03  | 4937.19 |
| 3199.01 | 2781.30 | 3575.68 | 3238.79 | 951.64  | 2892.44 | 1259.84  | 4023.67  | 1877.18  | 12878.81 | 5941.39  | 5736.41 |
| 2621.47 | 1618.87 | 2062.74 | 1888.22 | 609.78  | 0       | 714.49   | 0        | 0        | 0        | 3634.68  | 3388.60 |
| 6674.13 | 5936.10 | 5833.54 | 4364.30 | 4373.97 | 5609.95 | 8524.56  | 9351.63  | 12836.30 | 13188.93 | 7057.83  | 5915.69 |
| 3488.07 | 4324.10 | 3154.43 | 1994.62 | 473.50  | 3149.08 | 4381.22  | 5487.67  | 7384.44  | 8376.15  | 2070.14  | 2299.52 |
| 3415.91 | 2176.62 | 692.01  | 198.70  | 367.99  | 0       | 1670.51  | 418.98   | 0        | 0        | 3218.62  | 4001.20 |
| 4814.66 | 5281.21 | 4875.58 | 4966.67 | 4632.30 | 8724.25 | 9959.52  | 9845.34  | 11476.80 | 5883.12  | 3696.32  | 5244.00 |
| 2501.33 | 667.55  | 1978.58 | 1209.59 | 198.46  | 0       | 236.06   | 220.42   | 5057.49  | 4670.71  | 5405.31  | 4983.48 |
| 3313.17 | 3400.96 | 2208.87 | 1044.21 | 0       | 0       | 4671.52  | 3603.21  | 5799.56  | 5518.61  | 3596.22  | 1852.71 |
| 2320.45 | 1564.86 | 1915.97 | 4373.97 | 3616.56 | 7254.61 | 10896.91 | 8746.99  | 10449.11 | 20550.30 | 9960.82  | 7024.39 |
| 5304.42 | 4836.82 | 5754.52 | 3815.12 | 2961.73 | 4792.38 | 8386.55  | 8031.76  | 11371.19 | 5482.33  | 1300.16  | 977.68  |
| 5301.06 | 5853.29 | 5522.54 | 5386.59 | 2479.44 | 4500.14 | 4993.13  | 5491.36  | 6169.54  | 5253.36  | 3678.16  | 3652.04 |
| 2970.37 | 3464.89 | 3029.88 | 3608.48 | 1132.46 | 0       | 3005.74  | 6399.92  | 3573.60  | 1856.13  | 3443.54  | 3627.40 |
| 2340.34 | 1517.45 | 1453.29 | 2041.50 | 2862.18 | 0       | 3223.10  | 5759.66  | 3885.69  | 2395.03  | 2217.66  | 1966.48 |
| 5347.37 | 3793.69 | 5935.38 | 6908.69 | 4620.66 | 5164.87 | 7438.85  | 5995.99  | 4159.50  | 6472.13  | 5044.69  | 5271.84 |
| 4381.01 | 4201.75 | 4151.06 | 4790.90 | 3349.16 | 3760.66 | 1502.82  | 2700.52  | 6015.73  | 0        | 1154.96  | 31.98   |
| 2855.78 | 2314.46 | 4096.76 | 1604.10 | 0       | 0       | 2584.75  | 4456.83  | 7094.09  | 10220.79 | 3726.83  | 1977.00 |
| 3108.84 | 681.98  | 2864.17 | 3814.09 | 3994.98 | 106.97  | 1557.55  | 467.38   | 0        | 0        | 0        | 837.71  |
| 2660.05 | 2445.76 | 3223.50 | 4691.38 | 4228.47 | 599.07  | 2997.43  | 408.04   | 0        | 3281.16  | 770.81   | 0       |
| 7049.51 | 5492.75 | 6664.27 | 7462.84 | 3818.03 | 3208.52 | 7332.15  | 5569.01  | 11897.85 | 10620.10 | 5269.99  | 4257.76 |
| 0       | 437.81  | 3329.19 | 3356.53 | 2472.65 | 2477.20 | 7614.91  | 8587.94  | 11037.68 | 3691.80  | 5285.67  | 4139.21 |
| 1599.78 | 1355.11 | 0       | 945.79  | 532.34  | 383.55  | 2067.69  | 3686.31  | 5800.38  | 2821.08  | 0        | 582.76  |
| 142.98  | 2066.38 | 3402.45 | 257.36  | 765.22  | 0       | 4043.78  | 1137.42  | 1510.24  | 0        | 159.31   | 610.38  |
| 5070.10 | 5447.91 | 6605.81 | 5828.75 | 3665.76 | 3713.41 | 7108.93  | 7486.45  | 14369.49 | 14953.14 | 10576.71 | 7612.16 |
| 5846.60 | 5497.29 | 6986.28 | 7444.46 | 5852.10 | 7650.13 | 5284.95  | 1846.66  | 4170.29  | 4381.15  | 2267.71  | 451.95  |
| 484.13  | 867.16  | 0       | 1226.03 | 2916.23 | 1354.32 | 0        | 3673.39  | 10196.52 | 8052.45  | 4121.10  | 3084.55 |
| 3595.62 | 2133.45 | 828.44  | 1416.27 | 2193.89 | 4995.70 | 6300.16  | 2972.86  | 6667.67  | 3546.88  | 0        | 1257.20 |
| 3444.78 |         |         |         |         |         |          |          |          |          |          |         |

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 569.35535      | 5          | .11111     | .11111          |
| 1103.00822     | 0          | 0          | .11111          |
| 1636.66110     | 2          | .04444     | .15556          |
| 2170.31397     | 5          | .11111     | .26667          |
| 2703.96684     | 5          | .11111     | .37778          |
| 3237.61971     | 6          | .13333     | .51111          |

|             |   |        |         |
|-------------|---|--------|---------|
| 3771.27259  | 7 | .15556 | .66667  |
| 4304.92546  | 1 | .02222 | .68889  |
| 4838.57833  | 3 | .06667 | .75556  |
| 5372.23120  | 6 | .13333 | .88889  |
| 5905.88408  | 2 | .04444 | .93333  |
| 6439.53695  | 1 | .02222 | .95556  |
| 6973.18982  | 1 | .02222 | .97778  |
| 7506.84269  | 1 | .02222 | 1.00000 |
| 8040.49557  | 0 | 0      | 1.00000 |
| 8574.14844  | 0 | 0      | 1.00000 |
| 9107.80131  | 0 | 0      | 1.00000 |
| 9641.45418  | 0 | 0      | 1.00000 |
| 10175.10706 | 0 | 0      | 1.00000 |
| 10708.75993 | 0 | 0      | 1.00000 |

MONTH= 1 CHI-SQUARE= 31.738095

VARIANCE= 3280208.529907 STANDARD DEV.= 1811.134597

AVERAGE MONTHLY FLOW= 3375.698962

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 702.64460      | 3          | .06667     | .06667          |
| 1066.11566     | 3          | .06667     | .13333          |
| 1429.58672     | 1          | .02222     | .15556          |
| 1793.05778     | 5          | .11111     | .26667          |
| 2156.52884     | 4          | .08889     | .35556          |
| 2519.99991     | 5          | .11111     | .46667          |
| 2883.47097     | 3          | .06667     | .53333          |
| 3246.94203     | 1          | .02222     | .55556          |
| 3610.41309     | 4          | .08889     | .64444          |
| 3973.88415     | 2          | .04444     | .68889          |
| 4337.35521     | 3          | .06667     | .75556          |
| 4700.82627     | 2          | .04444     | .80000          |
| 5064.29733     | 2          | .04444     | .84444          |
| 5427.76839     | 1          | .02222     | .86667          |
| 5791.23945     | 4          | .08889     | .95556          |
| 6154.71051     | 2          | .04444     | 1.00000         |
| 6518.18157     | 0          | 0          | 1.00000         |
| 6881.65263     | 0          | 0          | 1.00000         |
| 7245.12370     | 0          | 0          | 1.00000         |
| 7608.59476     | 0          | 0          | 1.00000         |

MONTH= 2 CHI-SQUARE= 34.600000

VARIANCE= 2590737.098083 STANDARD DEV.= 1609.576683

AVERAGE MONTHLY FLOW= 3041.577522

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 552.49585      | 6          | .13333     | .13333          |
| 940.36360      | 2          | .04444     | .17778          |
| 1328.23136     | 1          | .02222     | .20000          |
| 1716.09911     | 3          | .06667     | .26667          |

|            |   |        |         |
|------------|---|--------|---------|
| 2103.96686 | 4 | .08889 | .35556  |
| 2491.83462 | 2 | .04444 | .40000  |
| 2879.70237 | 3 | .06667 | .46667  |
| 3267.57013 | 4 | .08889 | .55556  |
| 3655.43788 | 4 | .08889 | .64444  |
| 4043.30563 | 1 | .02222 | .66667  |
| 4431.17339 | 2 | .04444 | .71111  |
| 4819.04114 | 2 | .04444 | .75556  |
| 5206.90890 | 3 | .06667 | .82222  |
| 5594.77665 | 1 | .02222 | .84444  |
| 5982.64440 | 3 | .06667 | .91111  |
| 6370.51216 | 0 | 0      | .91111  |
| 6758.37991 | 2 | .04444 | .95556  |
| 7146.24767 | 2 | .04444 | 1.00000 |
| 7534.11542 | 0 | 0      | 1.00000 |
| 7921.98317 | 0 | 0      | 1.00000 |

MONTH= 3 CHI-SQUARE= 25.833333

VARIANCE= 4261595.604614 STANDARD DEV.= 2064.363244

AVERAGE MONTHLY FLOW= 3128.565471

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 618.74378      | 8          | .17778     | .17778          |
| 1211.70243     | 6          | .13333     | .31111          |
| 1804.66109     | 5          | .11111     | .42222          |
| 2397.61974     | 4          | .08889     | .51111          |
| 2990.57840     | 0          | 0          | .51111          |
| 3583.53706     | 4          | .08889     | .60000          |
| 4176.49571     | 3          | .06667     | .66667          |
| 4769.45437     | 4          | .08889     | .75556          |
| 5362.41302     | 3          | .06667     | .82222          |
| 5955.37168     | 3          | .06667     | .88889          |
| 6548.33033     | 1          | .02222     | .91111          |
| 7141.28899     | 1          | .02222     | .93333          |
| 7734.24764     | 2          | .04444     | .97778          |
| 8327.20630     | 1          | .02222     | 1.00000         |
| 8920.16495     | 0          | 0          | 1.00000         |
| 9513.12361     | 0          | 0          | 1.00000         |
| 10106.08227    | 0          | 0          | 1.00000         |
| 10699.04092    | 0          | 0          | 1.00000         |
| 11291.99958    | 0          | 0          | 1.00000         |
| 11884.95823    | 0          | 0          | 1.00000         |

MONTH= 4 CHI-SQUARE= 16.991667

VARIANCE= 5282484.295654 STANDARD DEV.= 2298.365570

AVERAGE MONTHLY FLOW= 2987.776742

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 389.05784      | 7          | .15556     | .15556          |
| 772.16526      | 5          | .11111     | .26667          |

|            |   |        |         |
|------------|---|--------|---------|
| 1155.27268 | 5 | .11111 | .37778  |
| 1538.38011 | 0 | 0      | .37778  |
| 1921.48753 | 1 | .02222 | .40000  |
| 2304.59495 | 3 | .06667 | .46667  |
| 2687.70238 | 4 | .08889 | .55556  |
| 3070.80980 | 4 | .08889 | .64444  |
| 3453.91723 | 1 | .02222 | .66667  |
| 3837.02465 | 4 | .08889 | .75556  |
| 4220.13207 | 1 | .02222 | .77778  |
| 4603.23950 | 2 | .04444 | .82222  |
| 4986.34692 | 4 | .08889 | .91111  |
| 5369.45434 | 1 | .02222 | .93333  |
| 5752.56177 | 1 | .02222 | .95556  |
| 6135.66919 | 1 | .02222 | .97778  |
| 6518.77661 | 1 | .02222 | 1.00000 |
| 6901.88404 | 0 | 0      | 1.00000 |
| 7284.99146 | 0 | 0      | 1.00000 |
| 7668.09889 | 0 | 0      | 1.00000 |

MONTH= 5 CHI-SQUARE= 27.819048

VARIANCE= 3385164.950623 STANDARD DEV.= 1839.881776

AVERAGE MONTHLY FLOW= 2458.087452

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1181.25615     | 18         | .40000     | .40000          |
| 2166.14868     | 4          | .08889     | .48889          |
| 3151.04120     | 4          | .08889     | .57778          |
| 4135.93373     | 4          | .08889     | .66667          |
| 5120.82625     | 5          | .11111     | .77778          |
| 6105.71878     | 4          | .08889     | .86667          |
| 7090.61130     | 0          | 0          | .86667          |
| 8075.50383     | 3          | .06667     | .93333          |
| 9060.39635     | 2          | .04444     | .97778          |
| 10045.28888    | 1          | .02222     | 1.00000         |
| 11030.18140    | 0          | 0          | 1.00000         |
| 12015.07393    | 0          | 0          | 1.00000         |
| 12999.96645    | 0          | 0          | 1.00000         |
| 13984.85898    | 0          | 0          | 1.00000         |
| 14969.75150    | 0          | 0          | 1.00000         |
| 15954.64403    | 0          | 0          | 1.00000         |
| 16939.53655    | 0          | 0          | 1.00000         |
| 17924.42908    | 0          | 0          | 1.00000         |
| 18909.32160    | 0          | 0          | 1.00000         |
| 19894.21413    | 0          | 0          | 1.00000         |

MONTH= 6 CHI-SQUARE= 23.083333

VARIANCE= 8234207.319214 STANDARD DEV.= 2869.530854

AVERAGE MONTHLY FLOW= 2874.035906

|             |   |        |         |
|-------------|---|--------|---------|
| 1906.61153  | 5 | .11111 | .11111  |
| 1765.28919  | 5 | .11111 | .22222  |
| 2523.96685  | 3 | .06667 | .28889  |
| 3282.64451  | 7 | .15556 | .44444  |
| 4041.32216  | 1 | .02222 | .46667  |
| 4799.99982  | 6 | .13333 | .60000  |
| 5558.67748  | 4 | .08889 | .68889  |
| 6317.35514  | 3 | .06667 | .75556  |
| 7076.03279  | 0 | 0      | .75556  |
| 7834.71045  | 4 | .08889 | .84444  |
| 8593.38811  | 2 | .04444 | .88889  |
| 9352.06577  | 0 | 0      | .88889  |
| 10110.74342 | 2 | .04444 | .93333  |
| 10869.42108 | 1 | .02222 | .95556  |
| 11628.09874 | 2 | .04444 | 1.00000 |
| 12386.77640 | 0 | 0      | 1.00000 |
| 13145.45405 | 0 | 0      | 1.00000 |
| 13904.13171 | 0 | 0      | 1.00000 |
| 14662.80937 | 0 | 0      | 1.00000 |
| 15421.48703 | 0 | 0      | 1.00000 |

MONTH= 7 CHI-SQUARE= 58.35000

VARIANCE= 9633599.489990 STANDARD DEV.= 3103.804035

AVERAGE MONTHLY FLOW= 4475.813331

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROR. FCN. |
|----------------|------------|------------|-----------------|
| 1185.42144     | 8          | .17778     | .17778          |
| 2093.15695     | 5          | .11111     | .28889          |
| 3000.89245     | 3          | .06667     | .35556          |
| 3908.62795     | 4          | .08889     | .44444          |
| 4816.36346     | 7          | .15556     | .60000          |
| 5724.09896     | 4          | .08889     | .68889          |
| 6631.83446     | 5          | .11111     | .80000          |
| 7539.56997     | 1          | .02222     | .82222          |
| 8447.30547     | 2          | .04444     | .86667          |
| 9355.04097     | 3          | .06667     | .93333          |
| 10262.77647    | 3          | .06667     | 1.00000         |
| 11170.51198    | 0          | 0          | 1.00000         |
| 12078.24748    | 0          | 0          | 1.00000         |
| 12985.98298    | 0          | 0          | 1.00000         |
| 13893.71849    | 0          | 0          | 1.00000         |
| 14801.45399    | 0          | 0          | 1.00000         |
| 15709.18949    | 0          | 0          | 1.00000         |
| 16616.92500    | 0          | 0          | 1.00000         |
| 17524.66050    | 0          | 0          | 1.00000         |
| 18432.39600    | 0          | 0          | 1.00000         |

MONTH= 8 CHI-SQUARE= 32.502381

VARIANCE= 8567520.238281 STANDARD DEV.= 2927.032668

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1532.33052     | 8          | .17778     | .17778          |
| 2689.78502     | 1          | .02222     | .20000          |
| 3847.23953     | 3          | .06667     | .26667          |
| 5004.69403     | 4          | .08889     | .35556          |
| 6162.14853     | 7          | .15556     | .51111          |
| 7319.60303     | 6          | .13333     | .64444          |
| 8477.05753     | 2          | .04444     | .68889          |
| 9634.51204     | 0          | 0          | .68889          |
| 10791.96654    | 6          | .13333     | .82222          |
| 11949.42104    | 5          | .11111     | .93333          |
| 13106.87554    | 2          | .04444     | .97778          |
| 14264.33004    | 0          | 0          | .97778          |
| 15421.78455    | 1          | .02222     | 1.00000         |
| 16579.23905    | 0          | 0          | 1.00000         |
| 17736.69355    | 0          | 0          | 1.00000         |
| 18894.14805    | 0          | 0          | 1.00000         |
| 20051.60255    | 0          | 0          | 1.00000         |
| 21209.05706    | 0          | 0          | 1.00000         |
| 22366.51156    | 0          | 0          | 1.00000         |
| 23523.96606    | 0          | 0          | 1.00000         |

MONTH= 9 CHI-SQUARE= 66.896429

VARIANCE= 16905996.382813 STANDARD DEV.= 4111.690210

AVERAGE MONTHLY FLOW= 6359.353501

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 1236.09913     | 6          | .13333     | .13333          |
| 2400.79330     | 4          | .08889     | .22222          |
| 3565.48747     | 5          | .11111     | .33333          |
| 4730.18164     | 4          | .08889     | .42222          |
| 5894.87581     | 4          | .08889     | .51111          |
| 7059.56998     | 2          | .04444     | .55556          |
| 8224.26415     | 5          | .11111     | .66667          |
| 9388.95833     | 2          | .04444     | .71111          |
| 10553.65250    | 3          | .06667     | .77778          |
| 11718.34667    | 2          | .04444     | .82222          |
| 12883.04084    | 2          | .04444     | .86667          |
| 14047.73501    | 3          | .06667     | .93333          |
| 15212.42918    | 1          | .02222     | .95556          |
| 16377.12335    | 1          | .02222     | .97778          |
| 17541.81752    | 0          | 0          | .97778          |
| 18706.51170    | 0          | 0          | .97778          |
| 19871.20587    | 0          | 0          | .97778          |
| 21035.90004    | 1          | .02222     | 1.00000         |
| 22200.59421    | 0          | 0          | 1.00000         |
| 23365.28838    | 0          | 0          | 1.00000         |

MONTH= 10 CHI-SQUARE= 21.016667

VARIANCE= 24370886.847656 STANDARD DEV.= 4936.687842



| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 966.84294      | 7          | .15556     | .15556          |
| 1717.48754     | 3          | .06667     | .22222          |
| 2468.13214     | 4          | .08889     | .31111          |
| 3218.77674     | 1          | .02222     | .33333          |
| 3969.42134     | 7          | .15556     | .48889          |
| 4720.06594     | 3          | .06667     | .55556          |
| 5470.71054     | 6          | .13333     | .68889          |
| 6221.35514     | 3          | .06667     | .75556          |
| 6971.99974     | 2          | .04444     | .80000          |
| 7722.64434     | 2          | .04444     | .84444          |
| 8473.28894     | 1          | .02222     | .86667          |
| 9223.93354     | 1          | .02222     | .88889          |
| 9974.57814     | 3          | .06667     | .95556          |
| 10725.22274    | 2          | .04444     | 1.00000         |
| 11475.86734    | 0          | 0          | 1.00000         |
| 12226.51194    | 0          | 0          | 1.00000         |
| 12977.15654    | 0          | 0          | 1.00000         |
| 13727.80114    | 0          | 0          | 1.00000         |
| 14478.44574    | 0          | 0          | 1.00000         |
| 15229.09034    | 0          | 0          | 1.00000         |

MONTH= 11 CHI-SQUARE= 25.821429

VARIANCE= 9003741.148926 STANDARD DEV.= 3000.623460

AVERAGE MONTHLY FLOW= 4395.920025

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
| 809.45452      | 7          | .15556     | .15556          |
| 1495.93383     | 4          | .08889     | .24444          |
| 2182.41314     | 4          | .08889     | .33333          |
| 2868.89245     | 3          | .06667     | .40000          |
| 3555.37177     | 4          | .08889     | .48889          |
| 4241.85108     | 6          | .13333     | .62222          |
| 4928.33039     | 4          | .08889     | .71111          |
| 5614.80971     | 6          | .13333     | .84444          |
| 6301.28902     | 2          | .04444     | .88889          |
| 6987.76833     | 1          | .02222     | .91111          |
| 7674.24765     | 4          | .08889     | 1.00000         |
| 8360.72696     | 0          | 0          | 1.00000         |
| 9047.20627     | 0          | 0          | 1.00000         |
| 9733.68559     | 0          | 0          | 1.00000         |
| 10420.16490    | 0          | 0          | 1.00000         |
| 11106.64421    | 0          | 0          | 1.00000         |
| 11793.12352    | 0          | 0          | 1.00000         |
| 12479.60284    | 0          | 0          | 1.00000         |
| 13166.08215    | 0          | 0          | 1.00000         |
| 13852.56146    | 0          | 0          | 1.00000         |

MONTH= 12 CHI-SQUARE= 17.702381

AVERAGE MONTHLY FLOW= 3419.863705

ANNUAL SYNTHETIC FLOW

|          |          |          |          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 72280.38 | 20186.15 | 88733.50 | 47222.99 | 53348.08 | 49602.99 | 38094.18 | 47455.97 | 30708.36 | 50879.07 | 48219.37 | 18112.29 |
| 71056.47 | 66516.55 | 33900.36 | 41872.25 | 62078.28 | 36672.71 | 52252.02 | 48356.16 | 16538.86 | 89666.91 | 46582.97 | 16160.53 |
| 79399.78 | 27128.98 | 35009.05 | 88674.94 | 63014.65 | 58280.64 | 36112.41 | 29662.37 | 66153.65 | 36040.56 | 40931.41 | 17433.67 |
| 25305.68 | 78642.79 | 52430.59 | 19774.77 | 14095.51 | 92438.61 | 57679.57 | 35975.87 | 35908.13 |          |          |          |

| CLASS INTERVAL | OBS. FREQ. | PROB. FCN. | CUM. PROB. FCN. |
|----------------|------------|------------|-----------------|
|----------------|------------|------------|-----------------|

|              |   |        |         |
|--------------|---|--------|---------|
| 18716.72657  | 5 | .11111 | .11111  |
| 25088.32964  | 2 | .04444 | .15556  |
| 31459.93270  | 4 | .08889 | .24444  |
| 37831.53577  | 7 | .15556 | .40000  |
| 44203.13884  | 3 | .06667 | .46667  |
| 50574.74191  | 6 | .13333 | .60000  |
| 56946.34497  | 4 | .08889 | .68889  |
| 63317.94804  | 4 | .08889 | .77778  |
| 69689.55111  | 2 | .04444 | .82222  |
| 76061.15417  | 2 | .04444 | .86667  |
| 82432.75724  | 2 | .04444 | .91111  |
| 88804.36031  | 2 | .04444 | .95556  |
| 95175.96337  | 2 | .04444 | 1.00000 |
| 101547.56644 | 0 | 0      | 1.00000 |
| 107919.16951 | 0 | 0      | 1.00000 |
| 114290.77258 | 0 | 0      | 1.00000 |
| 120662.37564 | 0 | 0      | 1.00000 |
| 127033.97871 | 0 | 0      | 1.00000 |
| 133405.58178 | 0 | 0      | 1.00000 |
| 139777.18484 | 0 | 0      | 1.00000 |

ANNUAL CHI-SQUARE= 14.854762