Nombre de Programa: CORCAU Significado: CORRECCION DE CAUDALES

Autor/Programador : A.BECERRA Ubicación : DISCO HIDRO 2

Revisión : 03-02-78/WY Lenguaje : DATA GENERAL FORTRAN IV

Tipo de Programa: MANEJO DE DATOS BASICOS

Próposito : Para ajustar series mensuales de descargas por ingerencias conocidas aguas arriba en el caudal natural expresadas como cantidades mensuales constantes.

Metodología Empleada: El programa añade o sustrae el vector de cantidades mensuales de las series históricas especificadas. Cualquier valor negativo resultante se reempleza por 0.0. La secuencia ajustada se escribe en el archivo de salida ⌀CMA-. La entrada interactiva del terminal consiste de: Nombre del archivo que contiene el vector corrector, Número de series históricas a corregirse, Nombre del archivo que contiene la secuencia a corregirse, sean cantidades a añadirse o a sustraerse, Período sobre el cual se aplicará la corrección.

Subrutina : Ninguna

Límites de dimensión : Ninguno

Archivos de Entrada : ⌀ICMH-. Corrección por usos de irrigación
⌀RCMH-. Corrección por efectos de regulación
⌀DCMH-. Corrección por derivaciones
⌀CMH- , ⌀CMA-. , ó ⌀CME-.

Formatos de Entrada : Archivos de Corrección : Línea de texto (1X, 80 A1)
Vector mensual (8X, 12F62)

Archivos ⌀CM- : Archivo Estandar Formato 2.1

Salida: Archivo ⌀CMA-. Archivo Estandar Formato 2.1
Resultados desplegados por el VDU.

Nombre de Programa : SVM Significado: SUMAR VALORES MENSUALES

Autor/Programador : T.WYATT Ubicación : DISCO HIDRO 1

Revisión: 04-03-79/WY Lenguaje : DATA GENERAL FORTRAN IV

Tipo de Programa: MANEJO DE DATOS BASICOS

Próposito: Sumar valores mensuales pluviométricos en años totales calendarios o hidrológicos.

Metodología Empleada : La lista de archivos mensuales de precipitación a procesarse se leen del archivo 'SL'. Se accesan sucesivamente los archivos de datos y se calculan bs totales anuales. Se escriben los resultados en los archivos creados ⁄LAH-.

Subrutinas : CRHI

Límites de dimensión: 36 años de datos

Archivos de Entrada : SL
⁄LMH-

Formatos de Entrada : "SL" : Nombres de archivos 5A2
⁄LMH-. : Formato de archivo estandar 2.2

Salida : Archivos ⁄LAH-. Formato de Archivo Estandar 2.3

3.2 RECONSTITUCION DE SECUENCIAS MENSUALES DE DESCARGAS

A fin de llevar a cabo la reconstitución y extensión de todas las secuencias de descargas históricas mensuales disponibles a un período base seleccionado, se desarrollaron una serie de programas en torno a la metodología bien establecida incorporada en el "Hydrologic Engineering Center Program Nº 4 ". Esta serie y su funcionamiento general se muestra en la Fig. 3-2 y 3-3, siendo los programas constituyentes:

Programa RSA : que extrae los valores de caudal mensual de la base de datos, ordena la información para los formatos requeridos por el HEC4M y crea archivos temporales de trabajo en disco para el HEC4M.

Programa HEC-4M : una versión especialmente desarrollada del programa básico HEC4 modificada para correrse en sistemas de minicomputadora e incorporar ciertos cambios para mejorar la eficiencia de los dispositivos de computación y la salida de la información.

Programa QCOM : que compara dos secuencias mensuales y calcula los parámetros estadísticos básicos; en este caso las secuencias comparadas son : (caudales históricos + caudales pronosticados faltantes) vs (todos los caudales pronosticados).

Programa QSPLIT : que desagrega el archivo en disco que contiene las secuencias reconstituídas y crea archivos individuales para la base de datos.

La operación secuencial del paquete de programas es completamente automática y es activada por un archivo macro "HEC4RUN .MC " que opera al nivel (CLI)del sistema. El contenido de este macro es:

```
DELETE/V (QH, QP)
RSA
XFER/A   Q     QH
HA1
QCOM
QSPLIT
```

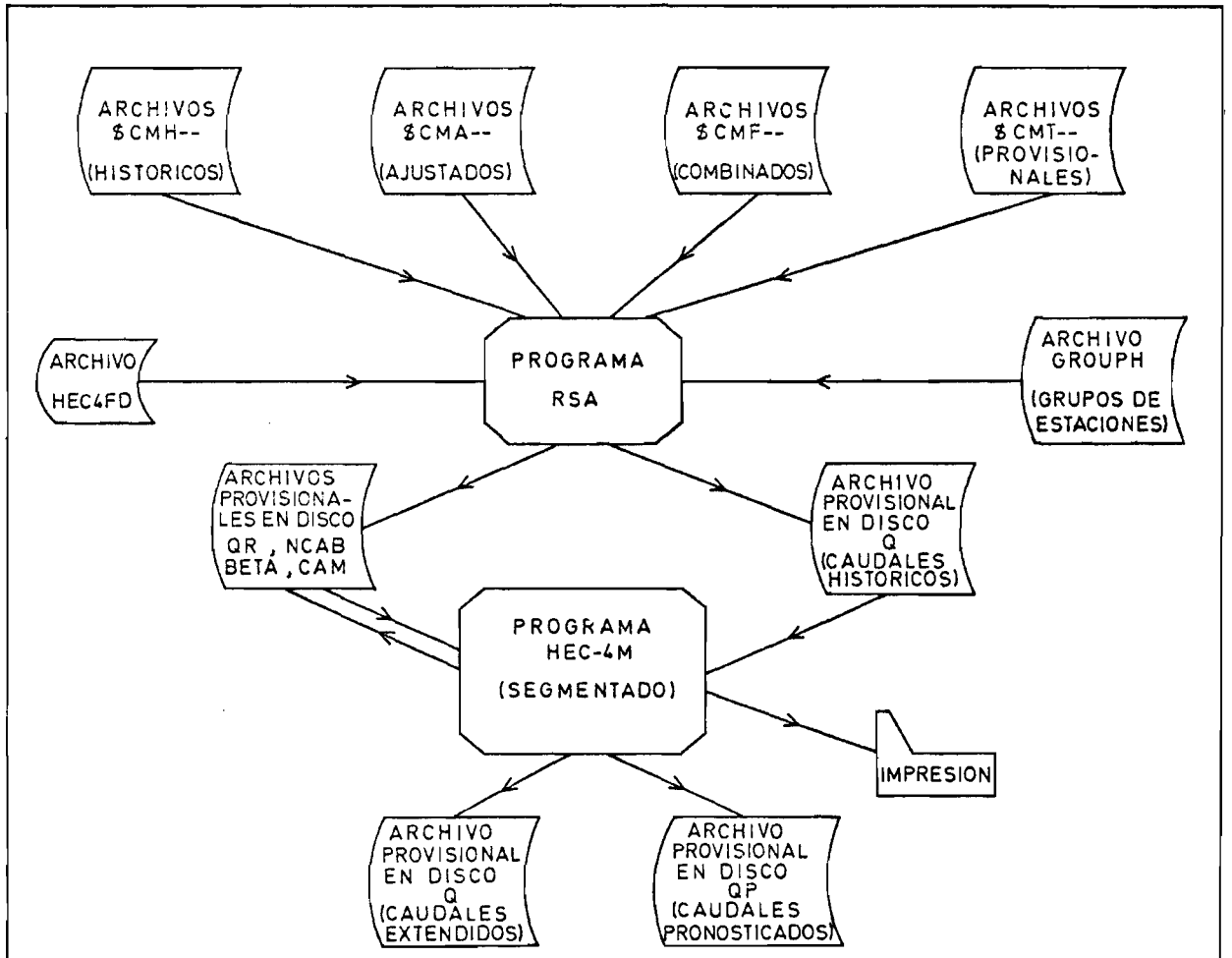
A fin de elaborar secuencias extendidas para un grupo dado de registros mensuales se debe adoptar el siguiente procedimiento:

a) inserte los códigos de las estaciones en el grupo, como primera línea del archivo GROUPH, indicando el tipo de registro a ser accesado (Ver descripción del RSA)

b) si fuera necesario cambie los parámetros de especificación de corrida en el archivo HEC4FD (Ver descripción del HEC4M)

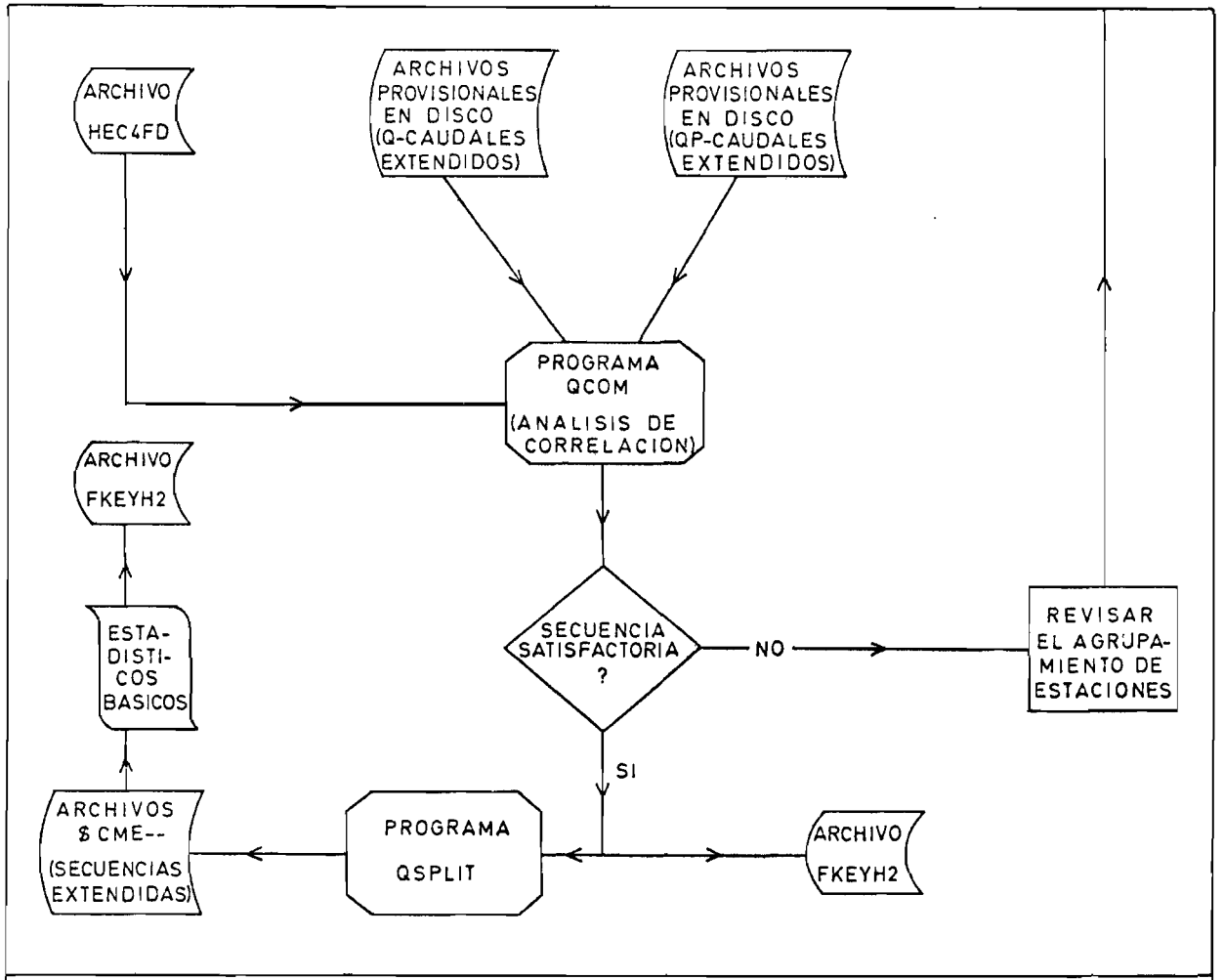
c) active el macro "HEC4RUN "; se requiere 32 K de memoria

ATENCION : En el paquete de programas se crean automáticamente archivos extendidos y éstos reemplazarán a cualquier archivo $CME-. existente, donde -. representa el número de código de la estación



ARCHIVO LS4P1 HOJA DE ACTIVIDADES 4/1: EXTENSION DE REGISTROS DE CAUDALES MENSUALES

FIG. 3-2



ARCHIVO LS4P2 HOJA DE ACTIVIDADES 4/2: EXTENSION DE REGISTROS DE CAUDALES MENSUALES FIG. 3-3

Nombre de Programa : RSA Significado: EXTRAE DATOS Y ESTABLECE ARREGLOS (RETRIEVE DATA AND SET ARRAYS

Autor/Programador : T.WYATT Ubicación : DISCO HIDRO 2

Revisión : 07-02-78/RB Lenguaje : DATA GENERAL FORTRAN IV

Tipo de Programa : EXTRACCION DE DATOS

Próposito : Preparar la entrada para el programa HEC 4M extrayendo la información de la base de datos hidrológica, cambiando formatos y creando archivos en disco temporales.

Metodología Empleada : La primera línea del archivo "GROUPH" contiene el grupo de estación que especifica el número de grupo, número de estaciones, número de años en el período base y los códigos de estaciones. El código convencional de 6 cifras es empleado con el tipo de registro: Histórico (H), Ajustado (A), Ficticio (F), Temporal (T) o Extendido (E), especificado para cada estación. Cada registro de descarga correspondiente a $CM (H), (A), (E), (F), (T) -----. se lee entonces en orden y se coloca en el archivo Q. El archivo Q se duplica en QH para su uso posterior. Se crean los archivos QR, NCAB, BETA y CAM listos para su empleo en el programa HEC4M. El archivo de datos fijos "HEC4FD" contiene las especificaciones para cada corrida y corresponde esencialmente a los registros de entrada A, B, C en el original (Ver manual HEC4). Es decir, el registro "A" contiene 3 líneas de texto y los registros "B" y "C" contienen los parámetros de especificación. En el presente estudio todas las cantidades excepto NSTA fueron constantes de corrida a corrida. El indicador de pronóstico de caudales IPRED puede fijarse en 0 ó 1 (NO, SI) según se desee. Cualquier otro cambio es especificación debe hacerse en este archivo.

Subrutinas: SCRIB
LIQ
RAW

Límites de dimensión : 10 estaciones por corrida

Archivos de Entrada : $CMH- , $CMA- , $CME- , $CMF- , $CMT-
GROUPH
HEC4FD

Formatos de Entrada : Archivos $CM- : Formato Estandar 2.1
GROUPH : Número de grupo, códigos de archivos de datos, número de estaciones en el período base (I3, 10 (3A2,A1), I2, I4).

Salida : HEC4FD : ver descripción HEC4M
Archivos en disco temporales Q, QH, QR, NCAB, BETA y CAM (Ver descripción HEC4M).
Funcionamiento desplegado por el VDU; no hay salida a la impresora.

Nombre de Programa : HEC4M Significado: HYDROLOGIC ENGINEERING CENTER PORGRAMA Nº 4 - MODIFICADO PARA USO EN MINICOMPUTADORA.

Autor/Programa : HEC/S.ROBINSON

Revisión : 07-02-78/RB Lenguaje : DATA GENERAL FORTRAN IV

Tipo de Programa: ANALITICO

Próposito: Relleno y extensión de datos mensuales de precipitación o descarga.

Metodología Empleada : Esta es una versión modificada del Programa Nº 4 de simulación mensual de descargas del "Hydrologic Engineering Center". El manual correspondiente ha sido publicado por HEC, U.S. ARMY CORPS OF ENGINEERS, DAVIS CALIFORNIA FEB. 1971. En consecuencia la descripción presente se limita a una breve presentación de la metodología subyacente y las modificaciones efectuadas para implementar el programa en la minicomputadora de la DATA GENERAL ECLIPSE S/200

La metodología consiste básicamente en una regresión múltiple en varios puntos realizada sobre valores mensuales con desfases 0 y 1 . Se pueden considerar hasta 10 estaciones que contienen registros mensuales translapadas en el período de extensión deseado y con 3 valores registrados al menos en cualquier mes.

Cada registro de estación se convierte en valores variables estandar normalizados mediante:

a) Una transformación logarítmica

b) Una transformación que elimine efectos estacionales (restando la media mensual y dividiendo entre la desviación estandar mensual).

c) Una transformación Pearson III.

Se calcula la correlación entre estaciones para cada mes y su precedente entre todos los pares de estaciones utilizando estos valores de variables reducidos. Todos los valores faltantes en cada estación en el período de extensión se estiman por medio de una regresión múltiple.

$$X_{I,KD} = \sum_{\substack{K=1 \\ K\neq KD}}^{NSTA} A_K * X_{I,K} + \sum_{K=1}^{NSTA} B_K * X_{I-1,K} + Z_{I,K} * \sqrt{(1-R^2_{I,K})}$$

donde:

X = valores variables reducidos de caudal
A = coeficientes de regresión (desfase 0)
B = coeficientes de regresión (desfase 1)

I = número de mes
K = número de estación
KD = número de estación de la variable dependiente
R = coeficiente de correlación múltiple
Z = número aleatorio (distribuido normalmente)

De las variables independientes se elige el valor de desfase o (si existe, de otra manera el valor de desfase 1) de tal modo que el número total máximo de variables independientes = número de estaciones en el grupo.

Se lleva a cabo una prueba de consistencia mediante la cual se elimina una por una las variables independientes con menor correlación absoluta hasta que se logre la consistencia (coeficiente de determinación < 1.0). Los resultantes valores variables extendidos y rellenados se convierten nuevamente en caudales por medio de las transformaciones c), b) y a)

Modificaciones para uso en Minicomputadora

Se incluye un informe detallado acerca de las modificaciones efectuadas al programa original como anexo a esta sección.

Segmentos y Subrutinas:

Segmento	Nombre de Archivo	Subrutina/Nombre de Archivo					
A1	HA1	QROW					
A2	HA2	QROW					
A3	HA3	QROW					
A4	HA4	QROW	H3D				
B	HB	QROW	H3D				
D	HD	H3D					
E1	HE1	QROW	QROWF	QRRW	H3D	HEC43	RAND*
E2	HE2	QROW	QROWF	QRRW			

* En Assembler y sólo Reubicable.

Subrutinas	Propósito
HEC 43	Resuelve un grupo de ecuaciones lineales
RAND	Generador de número aleatorios (función)
QROW	Encuentra una fila (vector) de caudales mensuales en el año J, estación K, del archivo "Q" (utiliza el dispositivo "FSEEK" de la Data General).
QROWF	Similar al QROW pero con especificación de número de canal NCH parámetros (NCH, Q, K, J, NYRS, IND))
QROW	Similar al QROW para acceso de archivo QR (indicador de caudales)
H3D	Encuentra elementos de los arreglos tridimensionales de acuerdo al número de canal NCH. El arreglo es A,B, o IA dependiendo de NCH.

Los elementos son para todas las estaciones K=1, NSTA en todas las profundidades L=1,2*NSTA en el mes IM (parámetros (NCH,A,IM, NSTA, IND, IA, B)
IND=0,1 para READ, WRITE (lectura, escritura)

Límites de dimensión: 10 estaciones por grupo

Archivos de Entrada : GROUP, $CM-.
HEC4FD

Archivos en Disco Temporales

Q	El archivo de descargas mensuales colectivos para el HEC4 contiene; en la entrada, los caudales históricos y en la salida, los caudales extendidos.
QR	Archivo indicador del caudal
NCAB	Archivo que contiene arreglos tridimensionales colectivos.
BETA	Archivo que contiene arreglos tridimensionales colectivos.
CAM	Archivo que contiene arreglos tridimensionales colectivos.

Formatos de Entrada: ARCHIVOS $CM- : Formato Estandar 2.1
GROUP H : Ver descripción del programa RSA.

Código de Registro	Número de Registro	Cantidades de Entrada	Formato
A	1	TEXT	40A2
A	2	TEXT, NSTA, NYRS	37A2, 12,14
A	3	TEXT	40A2
B	4	IYRA; IMNTH, IANAL, MXRCS, NYRG, NYMXG, NPASS,IPRED, IRNGEN, NSTALI	1X,17, 918
C	5	INCOMB, NTNDM,NCSTY,IGNRL NPROJ, IYPRJ, MTHPJ, LYRPJ.	1X, 17, 718

CLAVE

TEXT = Texto arbitrario
NSTA = Número de estación en el grupo
NYRS = Número de años
IYRA = Primer año de registro
IMNTH = Primer mes calendario de caudal
IANAL = Análisis estadístico requerido (sí = 1, no = Ø)
MXRCS = Número de años de caudales máximos y mínimos (= NYRS)
*NYRG = Número de años de generación (=0)
*NYMXG = Número de años de máximos y mínimos para caudales generados (=Ø)
*NPASS = Número de paso (= 1)
IPRED = Pronóstico de caudal (sí = 1, no = Ø)

#IRNGEN = Generador de números aleatorios ? (sí = 1, no = ø)
NSTALI = Número de estaciones (= NSTA)
*NCOMB = Número de combinaciones de estaciones (= 0)
NTNDM = Número de estaciones tándem (=0)
NCST4 = Número de pruebas de consistencia (= 0)
*IGNRL = NPROJ=IYRPJ=MTHPJ=MTHPJ=LYRPS (= 0)

Salida : Archivos en disco Q, QH.
Salida de la impresora; se acompaña muestra

---

* Valor fijado de especificación
\# Valor de la consola prevalece

MODIFICATIONS TO THE PROGRAM HEC4 FOR MINI-COMPUTER USE

DATA GENERAL ECLIPSE S/200

1. General

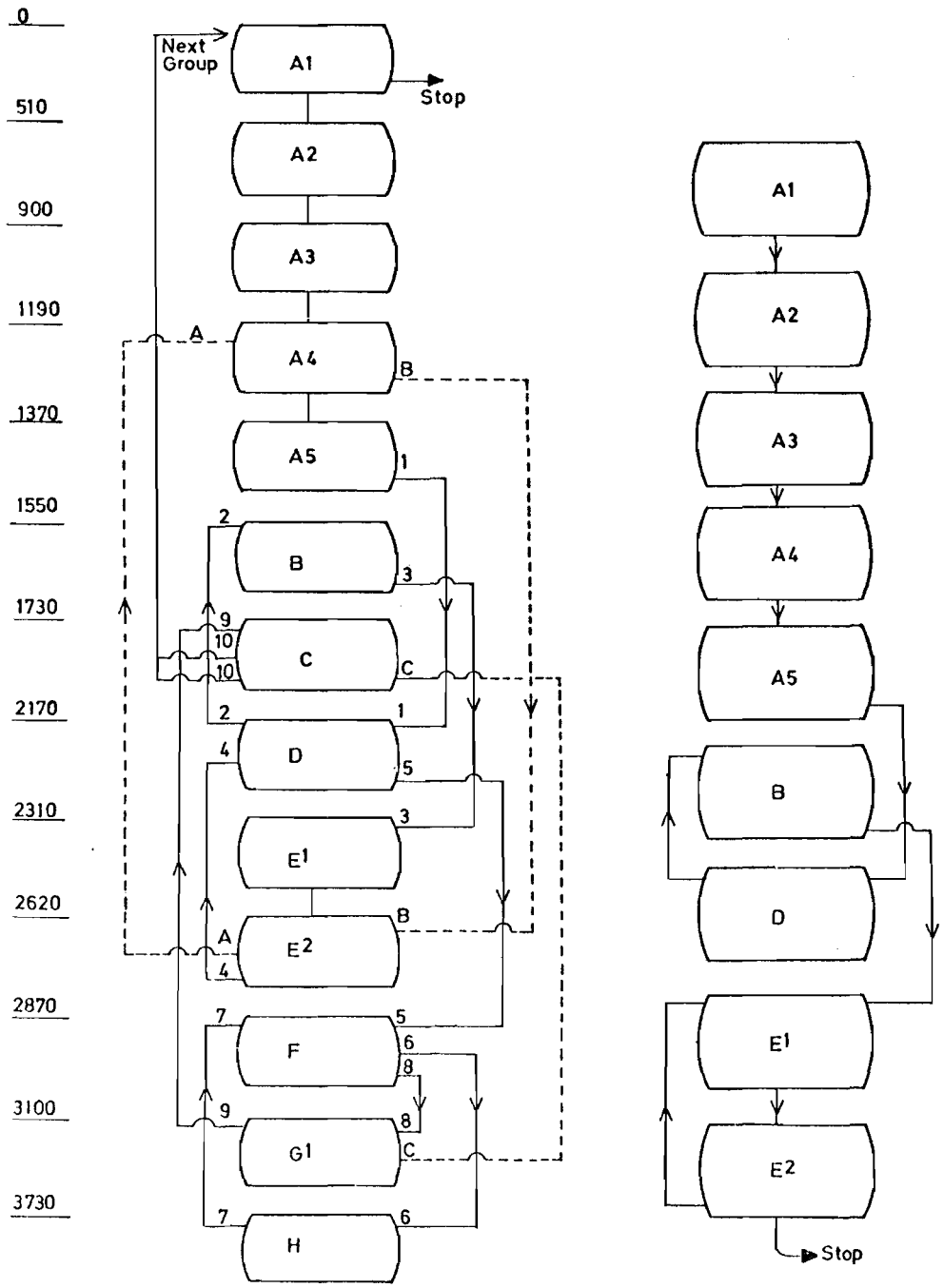
In its original form program HEC4 (main) contains 1787 lines of coding and requires approximately 45K real words of array core storage and therefore a suitably large computer. No information regarding previous attempts of installing HEC4 on a mini computer could be obtained (correspondence with Hydrologic Engineering Centre October 1976).

In order to run the program on the Data General Eclipse S/200 installation in Lima (basic configuration: 112k bytes, 2-byte word = 56K-14K (operating system) = 42K usable storage, allowing a maximum of 16K real words), the program needed to be reduced in size - both in physical size and array size such that the sum of all dimensioned arrays + other variables $\leqslant$ 16K real words.

2. Segmentation

This consists of partitioning the program into a chain of segments - each segment being a separate FORTRAN program unit of executable size which is executed in sequence. Using the Data General facility "CHAINING", the currently executing segment CALLs the next so that the execution is continued through the chain. The mode of execution is similar to a chain or nest of subroutines except that all arrays and variables are passed through in COMMON and only the currently executing program-segment occupies core storage at any one time. Each segment is identified by its file name and the executable version or "SAVE" file (Data General) contains all subroutines and functions required by that segment.

The original HEC4 FORTRAN coding was retained as far as possible with the partitioning made at convenient points e.g. at the end of a particular operation so that each segment represents an operational block. Because the original contains only one subroutine there exist many "IF" and "GO TO" transfer statements both backwards and forewards at various levels. To perform these particular operations. The basic system is retained except that such block operations are now contained in the program segments and are executed in sequence exactly as in the original. The segment chain and transfers are displayed in fig. 3-4



ORIGINAL HEC4 PROGRAM LINE (Approximate)

HEC4 PROGRAM STRUCTURE

HEC4M PROGRAM STRUCTURE

FIG. 3-4

3.Program Modifications

3.1.Modifications to coding

Many of the options e.g. combined stations, multipass and synthetic generation were not required and certainly would have presented additional complications. Thus, although the original coding was retained, many of the redundent statements were reduced to a comment (C in column 1). The tandem-station option was retained although not used. The coding or operational blocks of segments F,G1 and H - concerned only with data generation - were totally redundent so that the final segmented sequence - for data fill-in and extension pursoses only - shown in fig.1 can be seen to be a much simplified version of the original.

In addition Several miscellaneous changes were made including:
file open and close statements,
segment calls and switches,
calls to file-handling subroutines,
rearrangement of some I (months), J (year) and K (station) loops for more efficient handling of disk-stored data files

3.2 Modifications to methodology

a). It was not intended to modify the mathematical principles in any way but a very useful execution-time saving modification was discovered by limiting the number of independent variables in the regression equation to a maximum of 5 - selected on the basis of highest absolute correlation. This was considered justified because it was found that in most cases the final regression equation contained only 2 or 3 independent variables and very rarely more than 5 even if there were many more stations in the group

digression

The maximum number of independent variables = number of stations in the group. The regression is formed between the dependent variable in month I and the independents:- month I-1 at the same station, month I (if a value exists, if not month I-1, not both!) at all other stations. To obtain the final regression equation, variables with the least absolute correlation are eliminated until the correlation matrix is "consistent". This process - performed in segment E1 - consumes a great amount of time. The final regression equation is therefore not necessarily the same for each missing value in each station group and already filled-in values in other stations may be passed through as independent variables to the current regression. As a check the number of variables in the final equation is printed out for each filled-in value and the actual stations used in the regression can be found by locating the highest absolute correlations in the correlation table for the dependent variable (station) in month I.

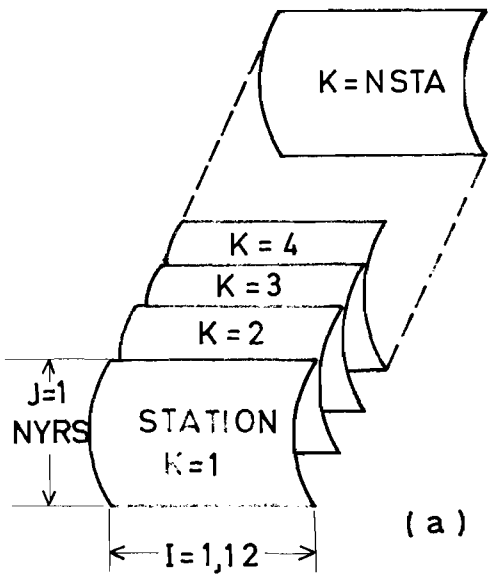
b). Because the program was to be used for reconstitution of the historic streamflow record at each station for a constant time period (1940-75) in order to improve the estimate of the long-term mean, the unexplained variance (stochastic) component of the regression, utilizing the random number generator was not included. It was considered that the best estimate of the missing historic value was given by the regression alone, especially since filled-in values were passed through as independent variables. The call to the random number generator was however included as an option via a 0,1 prompt on the console.

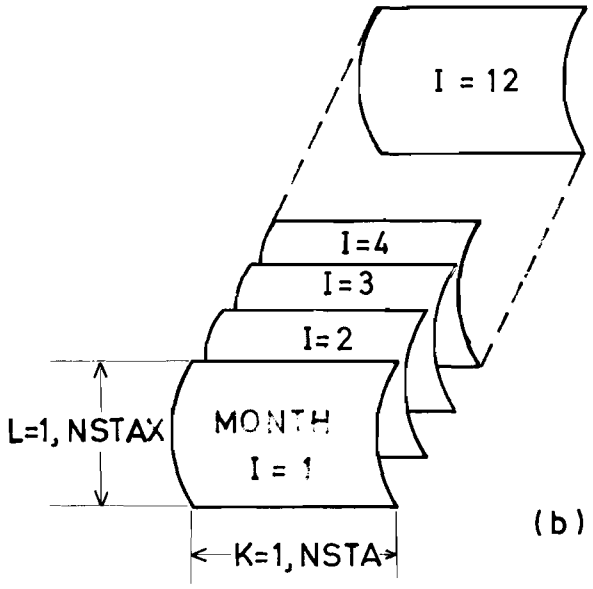
c). Apart from the individual interstation correlation (0 and 1 lag) no measure of the overall quality of fit is given in the original and, due to the differing lenths of historic records, an average value of correlation computed from the individual monthly correlations is not very representative. An appropriate modification was made whereby the station-month historic flows (dependent variable) were "predicted" from the historic and already extended values (independent variables). This necessitated additional coding in segments E1 and E2 and an option is specified in the fixed data file (see Ch.5). The predicted historic flows are stored on file and an overall correlation coefficient can be computed between the predicted and measure historic flows.

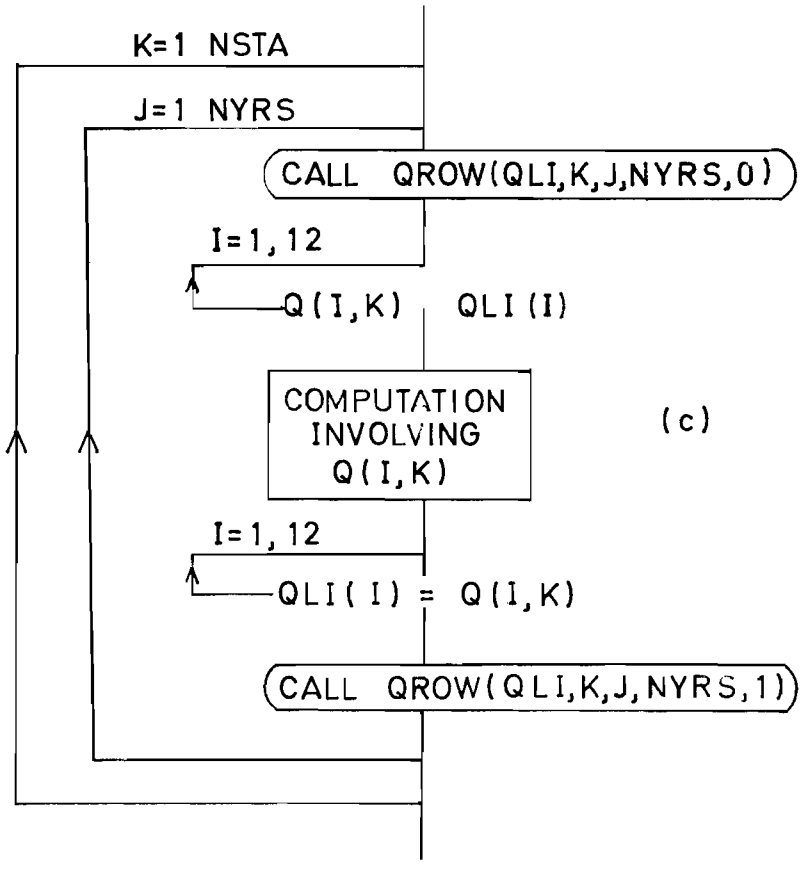
4.Reduction of Array Size

4.1. Q and QR arrays

The arrays Q (real) and QR (alpha) which store the flows and flow indicator (blank=historic, E=extended, P=predcted) respectively are dimensioned (1201,10) in the original. This represents 100(years) x 12(months) + 1(initial 1-lag flow) x 10 (number of stations) = 12010 real and integer words of storage. During execution the arrays are contained within I (months), J (years) and K (station) loops such that at any one time computations of flow statistics, correlations and regressions (performed sequentially) only involve the current and previous month (I,I-1) in year J for all stations K=1,NSTA. Thus only the monthly flows I=1,12 for the current year J + the 1-lag value (I=12) from the previous year for all stations K=1,NSTA need to be stored in central memory. The dimension required is therefore independent of years and, for a maximum NSTA=10, Q and QR arrays can be dimensioned (12,10) thereby saving 11770 words of storage.







PHYSICAL REPRESENTATION OF 2 AND 3 DIMENSIONAL ARRAY STORAGE

FIG. 3-5

Fig. 2a shows the storage configuration of the Q array stored on disk as file name "Q", containing initially the historic monthly flows for J=1,NYRS and K=NSTA. All missing values within the NYRS at each station are given a value -1.0. The "Q" file is accessed by the subroutine QROW which, according to the parameter specification, searches the Q file for the appropriate row or vector of monthly flows I=1,12 for year J in station K. The flow vector is temporarily stored in QLI(I) and is converted to Q(I,K) within the basic looping system shown in fig.2c.

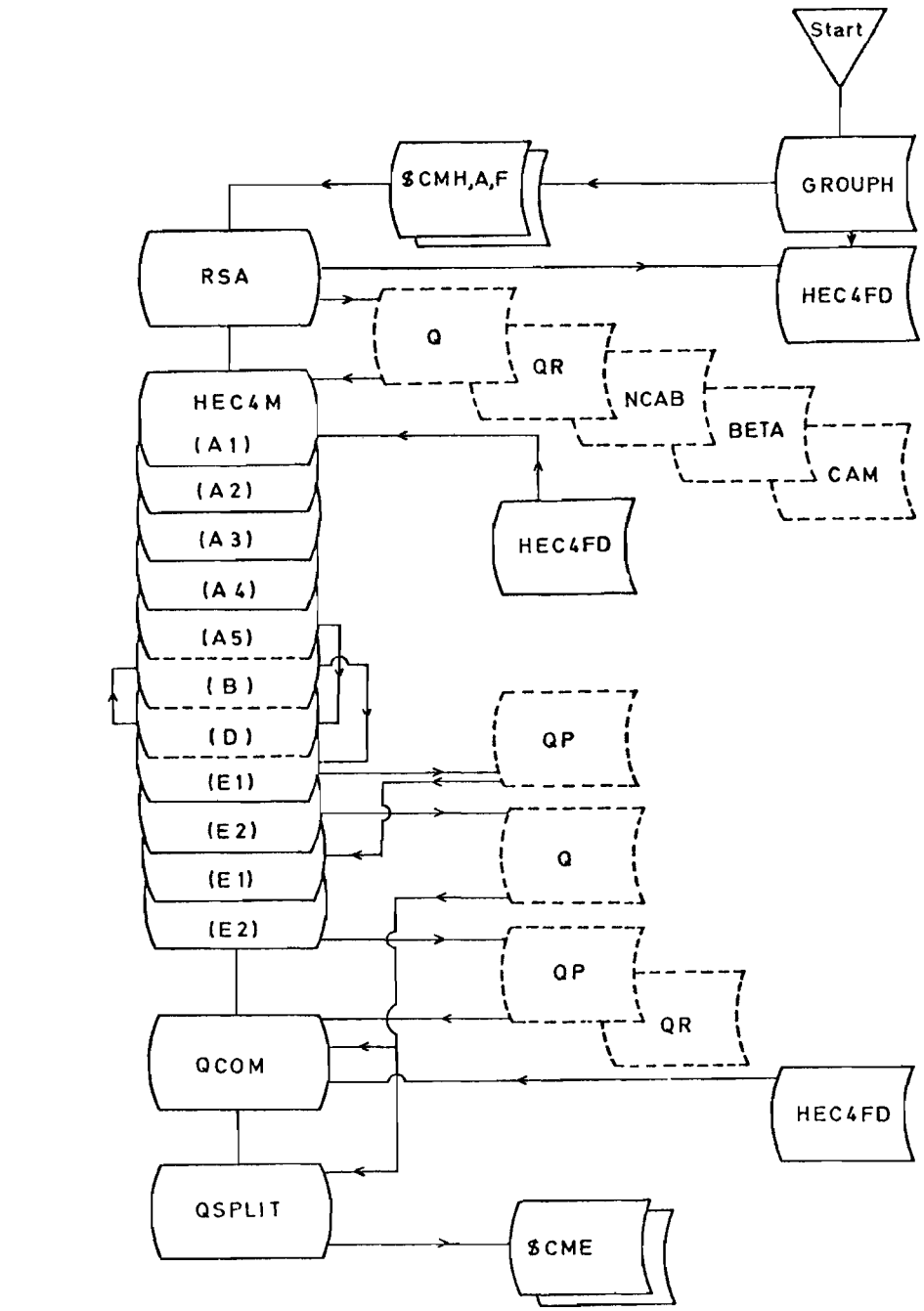
A similar subroutine accessing system is employed for the QR array, file name "QR", via subroutine QRRW and for the flow prediction array, file name "QP" via subroutine QROWF. For further details of array reduction and file handling see TABLE 1 and the program arrangement in Ch.5.

4.2. Three dimensional arrays

Of the 3-dimensional arrays 7 are dimensioned (12,10,20) and 1 (BETA, which is in fact redundent) (12,10,10) - necessitating 18000 words of storage. The subscripts (I,K,L) represent months, stations and stations*2 respectively. By arranging some of the I,K,L loops by putting I at the outside of the nest it was possible to reduce the dimension to (1,10,20) thereby saving 16480 words of storage. Thus for array SUMA(1,K,L) computations are performed on K,L elements in month I. Fig 2b shows the storage configuration of all 3-dimensional arrays which are accessed by subroutine H3D. The reduction process for all 2 and 3-dimensional arrays is tabulated in TABLE 1.

5. Program Arrangement

In order to combine the segmented version of HEC4 into an operational package on the Data General computer several small programs for reading, setting up and writing files were necessary. The combined program-file arrangement is shown in Fig. 3-6 and a brief discription of the programs and files is given in the annex.



HEC 4M PROGRAM SUITE

FIG. 3-6

5.1 Program RSA

Purpose: to set up input files for HEC4

operation: file "GROUP contains the station-group in which is specified the group number, number of stations, number of years and station codes. The conventional 6-figure code is used with the type of record:- historic (H), adjusted (A) ,ficticious (F), temporary (T) or extended (E) specified for each station. Each streamflow record corresponding to $CM(H),(A),(E),(F),(T)------ is then read in order and put into into file Q. File Q is duplicated in QH for later use. Similarly, files QR NCAB,BETA,and CAM are created ready for use in HEC4 (see fig 2b and TABLE 1)

The fixed data file HEC4FD contains the specifications for each run and corresponds essentially to the A,B,C input records in the original (see HEC4 manual) i.e record A contains 3 lines of text and records B and C contain specification parameters.

The file is set up as shown in TABLE 2 in which, for our purposes, all quantities except for NSTA are constant from run to run. The flow prediction indicator IPRED can be set to 0 or 1 (no,yes) as desired; any other changes in specification must be made in this file.

5.2.Program HEC4M

Purpose: monthly stramflow data fill-in and extension

operation: the segments are executed as described above. The principal addition to the methodology - flow prediction - necessitates duplicating the current "Q" file to "QP" in segment E1. At this point Q contains the filled in flows as Pearson III variates. The E1-E2 segment sequence is carried out twice - firstly for fill-in and extension, and secondly for prediction as shown in fig.3. TABLE 3. shows the HEC4M segments, their FORTRAN file names and required subroutines.

5.3.Program QCOM

purpose: to make an overall correlation analysis between the historic measured flows and the predicted flows

operation: the final Q,QP and QR files which contain the filled-in and extended flows, the predicted flows and flow indicator respectively, are read together with HEC4FD. A corellation is performed between the historic flows in the file Q and the predicted flows in file QP and a final summary table is printed out. QCOM calls subroutine QCOR.

5.4.Program QSPLIT

purpose: to create $CME------ file i.e. the extended (historic+filled-in) flow file for the station ------

operation: the resulting Q file is disagregated the individual station-flows which are written to files $CME------.

ARRAY NAME	ORIGINAL DIMENSION	NEW DIMENSION	COMPUTER DISK-FILE NAME	CHANNEL NUMBER	SUBROUTINE REFERENCE NUMBER	FORMAT	ARRAY SIZE
N	(1201,10)	(12,10)	N	1	-	12F7.2	(12*NSTA)*NYRS
QR	(1201,10)	(12,10)	QR	2	-	1212	"
NCAB	(1201,10)	(12,10)	NCAB	3	3	1014	(NSTA*NSTAX)*12
BETA	(12,10,20)	(1,10,20)	BETA	4	4	10F11.4	(NSTA*NSTA)*12
RA	(1 ,10,20)	(1,10,20)	CAL	5	7	"	(NASTA*NSTAX)*12
SQA	"	"	"	5	8	"	"
SQB	"	"	"	"	9	"	"
SUMA	"	"	"	"	11	"	"
SUMB	"	"	"	"	12	"	"
XPAB	"	"	"	"	13	"	"

TABLE 1 REDUCTION OF 2 AND 3 DIMENSIONAL ARRAYS
NYRS = NUMBER OF YEARS
NSTA = NUMBER OF STATIONS
NSTAX= NSTA*2

APPENDIX

PROGRAMS	PURPOSE
RSA	TO SET UP INPUT FILES FOR HEC4
HEC4	MULTISITE MONTHLY STREAMFLOW SIMULATION. SEGMENTED VERSION IS FOR DATA FILL-IN AND EXTENSION ONLY; CONTAINS A FLOW PREDICTION OPTION
QCOM	FOR BASIC FLOW STATISTICS AND CORRELATION BETWEEN HISTORIC AND PREDICTED FLOWS.
QSPLIT	DISAGREGATES THE FINAL OUTPUT FILES FROM HEC4

SUBROUTINES	PURPOSE
CROUTLI	SOLVES A SET OF LINEAR EQUATIONS; LI VERSION MODIFIED SLIGHTELY FOR USE ON DATA GENERAL
RAND	RANDOM NUMBER GENERATOR. (FUNCTION)
QROW	FINDS A ROW (VECTOR) OF MONTHLY FLOWS IN YEAR J, STATION K FROM FILE "Q" (UTILIZES DATA GENERAL FACILITY "FSEEK")
QROWF	SIMILAR TO QROW BUT WITH CHANNEL NUMBER SPECIFICATION NCH. [PARAMETERS (NCH,Q,K,J,NYRS,IND)]
QRRW	SIMILAR TO QROW FOR ACCESS OF FILE QR (FLOW INDICATOR).
H3D	FINDS ELEMENTS OF THE 3-DIMENSIONAL ARRAYS ACCORDING TO CHANNEL NUMBER NCH. ARRAY IS A,B OR IA DEPENDING ON NCH (SEE TABLE 3). ELEMENTS ARE FOR ALL STATIONS K=1,NSTA AT ALL DEPTHS L=1,2*NSTA IN MONTH IM [PARAMETERS (NCH,A,IM,NSTA,IND,IA,B) IND=0,1 FOR READ, WRITE.
QCOR	SUBROUTINE OF QCOM FOR BASIC STATISTICS OF EXTENDED FLOW SEQUENCE AND CORRELATION ANALYSIS BETWEEN HISTORIC QH AND PREDICTED FLOWS QP FOR NYRS. [PARAMETERS (QH,QP,NYRS,Q)]

TEST DATA

6204903E204799F204702A204604A204607A204699F 6 36
W

IYRA	IMNTH	IANAL	MXRCS	NYRG	NYMXG	NPASS	IPRED	IRNGN	NSTA	NCOMB	NTNDM	NCSTY	IGNRL	NPROJ	IYRPJ	MTHPJ	LYRPJ
1940	9	1	36	0	0	1	1	0	6	0	0	0	0	0	0	0	0

HEC4 - FLOW RECONSTITUTION AND PREDICTION
****

RANDOM NUMBER GENERATOR NOT SELECTED

FREQUENCY STATSTICS AFTER ADJUSTMENTS

NSTA	ITEM	9	10	11	12	1	2	3	4	5	6	7	8
1	MEAN	1.131	1.094	1.113	1.293	1.729	1.943	1.842	1.524	1.373	1.297	1.269	1.200
	STD DEV	0.151	0.140	0.176	0.229	0.349	0.306	0.296	0.198	0.161	0.146	0.145	0.139
	SKEW	0.572	1.542	1.154	0.005	-0.115	0.097	-0.159	-0.910	-1.045	-0.462	0.086	0.311
	INCRMT	0.14	0.13	0.14	0.22	0.72	1.11	0.86	0.36	0.25	0.21	0.19	0.17
2	MEAN	0.601	0.591	0.596	0.719	1.083	1.161	1.261	0.881	0.675	0.633	0.632	0.623
	STD DEV	0.191	0.180	0.170	0.225	0.434	0.490	0.407	0.389	0.244	0.198	0.205	0.195
	SKEW	1.201	1.386	1.614	1.745	-0.031	-1.283	0.083	0.555	1.066	1.029	1.235	1.307
	INCRMT	0.10	0.10	0.10	0.10	0.19	0.28	0.27	0.11	0.10	0.10	0.10	0.10
3	MEAN	-0.331	-0.311	-0.308	-0.274	-0.094	0.150	-0.125	-0.214	-0.249	-0.325	-0.371	-0.400
	STD DEV	0.470	0.440	0.454	0.574	0.698	0.738	0.821	0.539	0.539	0.530	0.542	0.518
	SKEW	0.220	0.404	0.417	-0.133	0.069	0.196	-0.015	0.123	-0.116	0.116	0.422	0.392
	INCRMT	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
4	MEAN	0.653	0.731	0.900	1.132	1.526	1.698	1.642	1.309	1.104	0.911	0.822	0.763
	STD DEV	0.151	0.174	0.253	0.289	0.319	0.270	0.274	0.240	0.230	0.120	0.108	0.112
	SKEW	0.402	-0.133	0.312	1.184	-0.306	0.180	-0.248	0.196	1.297	0.691	0.210	0.211
	INCRMT	0.10	0.10	0.10	0.18	0.48	0.81	0.61	0.32	0.16	0.10	0.10	0.10
5	MEAN	1.160	1.279	1.341	1.484	1.940	1.996	2.100	1.749	1.452	1.347	1.271	1.246
	STD DEV	0.150	0.100	0.129	0.241	0.286	0.169	0.256	0.212	0.138	0.090	0.082	0.112
	SKEW	-0.286	2.043	0.615	0.803	-0.755	-0.546	-1.282	-0.149	0.184	-1.002	-0.993	1.544
	INCRMT	0.18	0.19	0.23	0.36	1.10	1.93	2.02	0.73	0.34	0.23	0.19	0.18
6	MEAN	1.505	1.535	1.493	1.799	2.116	2.209	2.308	1.952	1.784	1.632	1.574	1.528
	STD DEV	0.133	0.133	0.139	0.203	0.304	0.214	0.233	0.228	0.180	0.131	0.131	0.109
	SKEW	-1.140	-1.456	-1.076	2.307	-0.369	-0.382	-0.135	-0.117	-0.078	-0.872	-0.735	-1.469
	INCRMT	0.32	0.31	0.32	0.55	1.57	2.36	2.44	1.07	0.66	0.45	0.40	0.35

RAW CORRELATION COEFICIENTS FOR MONTH 9 SEGMENT 0

STA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	0.096	0.020	-0.419	0.169	-0.139
2	0.096	1.000	0.237	0.100	0.312	0.488
3	0.020	0.237	1.000	0.464	-0.011	0.272
4	-0.419	0.100	0.464	1.000	-0.069	0.760
5	0.169	0.312	-0.011	-0.069	1.000	0.769
6	-0.139	0.488	0.272	0.760	0.769	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.938	-0.249	-0.141	-0.351	0.072	0.094
2	0.164	0.434	0.089	0.142	0.201	0.507
3	0.013	0.259	0.755	0.297	-0.027	0.311
4	-0.530	0.657	0.206	0.890	0.068	0.778
5	0.081	0.519	-0.144	-0.070	0.764	0.754
6	-0.197	0.855	-0.057	0.663	0.708	0.896

RAW CORRELATION COEFICIENTS FOR MONTH 10

STA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	-0.247	-0.087	-0.210	-0.058	-0.423
2	-0.247	1.000	-0.220	0.300	0.467	0.441
3	-0.087	-0.220	1.000	0.537	-0.106	-0.009
4	-0.210	0.300	0.537	1.000	-0.126	0.037
5	-0.058	0.467	-0.106	-0.126	1.000	0.345
6	-0.423	0.441	-0.009	0.037	0.345	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.778	-0.092	-0.035	-0.485	-0.049	-0.349
2	-0.343	0.577	0.031	0.377	0.462	0.596
3	-0.097	-0.214	0.615	0.607	-0.133	0.121
4	-0.328	0.018	0.427	0.768	-0.227	0.139
5	-0.004	0.125	-0.181	0.074	0.729	0.520
6	-0.251	0.383	0.198	0.469	0.533	0.798

RAW CORRELATION COEFICIENTS FOR MONTH 11

STA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	-0.024	-0.001	0.575	0.421	0.296
2	-0.024	1.000	-0.126	0.407	0.283	0.094
3	-0.001	-0.126	1.000	0.111	0.005	0.221
4	0.575	0.407	0.111	1.000	0.463	0.344
5	0.421	0.283	0.005	0.463	1.000	0.608
6	0.296	0.094	0.221	0.344	0.608	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.798	-0.185	0.054	-0.080	0.090	-0.156
2	-0.136	0.699	-0.084	0.287	0.475	-0.169
3	-0.102	0.079	0.471	0.323	-0.058	0.239
4	0.178	0.233	-0.039	0.445	0.022	-0.004
5	0.075	0.224	-0.198	-0.035	0.657	0.207
6	-0.223	0.350	0.006	0.160	0.409	0.639

AW CORRELATION COEFICIENTS FOR MONTH 12

NST-	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	0.244	0.212	0.562	0.404	0.481
2	0.244	1.000	0.246	0.213	-0.157	0.430
3	0.212	0.246	1.000	0.440	0.133	0.464
4	0.562	0.213	0.440	1.000	0.493	0.302
5	0.404	-0.157	0.133	0.493	1.000	0.171
6	0.481	0.430	0.464	0.302	0.171	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.405	-0.198	0.043	-0.000	0.219	-0.026
2	-0.071	0.277	-0.189	0.074	0.191	0.298
3	0.027	0.064	0.504	0.195	0.166	0.359
4	0.384	0.182	-0.010	0.633	0.268	-0.007
5	0.236	0.121	-0.035	0.381	0.665	0.225
6	0.264	-0.280	0.244	0.083	0.194	0.379

RAW CORRELATION COEFICIENTS FOR MONTH 1

STA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	0.431	0.494	0.792	0.875	0.778
2	0.431	1.000	0.597	0.413	0.531	0.722
3	0.494	0.597	1.000	0.332	0.376	0.659
4	0.792	0.413	0.332	1.000	0.797	0.799
5	0.875	0.531	0.376	0.797	1.000	0.898
6	0.778	0.722	0.659	0.799	0.898	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.272	0.510	0.352	0.429	0.109	0.323
2	0.251	0.486	0.314	0.401	-0.012	0.439
3	0.174	0.213	0.645	0.048	-0.026	0.481
4	0.274	0.472	0.136	0.425	0.010	0.099
5	0.245	0.501	0.214	0.493	0.226	0.262
6	0.459	0.569	0.316	0.493	-0.039	0.468

RAW CORRELATION COEFICIENTS FOR MONTH 2

NSTA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	0.152	0.635	0.717	0.700	0.610
2	0.152	1.000	0.185	0.412	0.256	0.370
3	0.635	0.185	1.000	0.464	0.680	0.687
4	0.717	0.412	0.464	1.000	0.776	0.796
5	0.700	0.256	0.680	0.776	1.000	0.759
6	0.610	0.370	0.687	0.796	0.759	1.000
			WITH PRECEDING MONTH AT ABOVE STATION			
1	0.631	0.163	0.334	0.633	0.529	0.343
2	0.139	0.537	-0.047	0.300	0.430	0.369
3	0.432	0.371	0.456	0.353	0.253	0.282
4	0.602	0.627	0.438	0.586	0.546	0.598
5	0.530	0.564	0.499	0.627	0.626	0.557
6	0.548	0.519	0.452	0.590	0.516	0.597

AW CORRELATION COEFICIENTS FOR MONTH 3

NSTA	1	2	3	4	5	6
			WITH CURRENT MONTH			
1	1.000	0.687	0.510	0.351	0.257	0.759
2	0.687	1.000	0.548	0.054	0.398	0.753
3	0.510	0.548	1.000	0.270	0.155	0.752
4	0.351	0.054	0.270	1.000	0.014	0.216

NO. OF INDEPENDENT VARIABLES - NINDP

			- - MONTHS - -											
YEAR= 1														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	2	5	5	5	4	4	4	2	5	4	5	5
	STATION	4	3	5	5	5	5	2	4	5	5	5	5	5
	STATION	5	4	4	4	5	5	4	3	3	4	5	2	4
	STATION	6	1	5	5	5	2	4	4	4	3	4	2	3
YEAR= 2														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	4	5	5	5	4	4	4	2	5	4	5	5
	STATION	4	3	5	5	5	5	2	4	5	5	5	5	5
	STATION	5	4	4	4	5	5	4	3	3	4	5	2	4
	STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 3														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	4	5	5	5	4	4	4	2	5	4	5	5
	STATION	4	3	5	5	5	5	2	4	5	5	5	5	5
	STATION	5	4	4	4	5	5	4	3	3	4	5	2	4
	STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 4														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	4	5	5	5	4	4	0	0	0	4	0	0
	STATION	4	3	5	5	5	5	2	4	5	5	5	5	5
	STATION	5	4	4	4	5	5	4	3	3	4	5	2	4
	STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 5														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	4	4	5	5	5	5	4	3	5	5	4	4	4
	STATION	5	4	5	4	5	5	5	3	3	4	4	4	4
	STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 6														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	4	4	5	5	5	5	4	3	5	5	4	4	4
	STATION	5	4	5	4	5	5	5	3	3	4	4	4	4
	STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 7														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	4	4	5	5	5	5	4	3	5	5	4	4	4
	STATION	5	4	5	4	5	5	5	3	3	4	4	4	4
	STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 8														
	STATION	1	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	2	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
	STATION	4	4	5	5	5	5	4	3	5	5	4	4	4
	STATION	5	4	5	4	5	5	5	3	3	4	4	4	4
	STATION	6	0	0	0	0	0	0	0	0	0	0	0	0

RECORDED AND RECONSTITUTED FLOWS

1	1940	12.14	10.60	10.57	7.73	43.04	46.68	26.67	17.82	19.73	15.30	18.42	12.72	243
1	1941	10.09	8.00	6.17	14.60	61.16	35.51	12.37	6.94	10.00	8.70	8.12	7.08	190
1	1942	6.62	7.11	6.94	5.14	62.16	96.71	71.40	50.92	30.62	21.15	14.25	11.84	385
1	1943	9.18	9.87	9.63	11.78	29.55	166.67	48.25	35.05	23.14	16.79	14.56	13.03	391
1	1944	9.18	10.60	14.32	26.13	119.07	165.02	52.92	38.50	32.10	22.70	16.00	13.64	521
1	1945	10.82	9.42	8.77	16.33	41.99	121.69	55.20	28.45	27.90	23.21	17.57	14.99	376
1	1946	10.82	9.20	8.37	29.23	48.30	32.70	19.04	10.57	9.07	10.78	12.09	11.44	212
1	1947	12.43	11.62	11.62	26.70	17.92	24.61	133.83	65.74	30.62	23.79	19.31	16.05	396
1	1948	15.34	16.11	15.35	28.01	39.95	73.26	92.44	37.71	26.08	22.70	26.08	18.43	410
1	1949	13.65	12.75	13.35	26.13	62.16	94.66	68.51	34.27	24.33	20.67	22.73	16.03	410
1	1950	11.87	11.10	11.62	24.38	52.85	86.27	76.99	34.27	24.33	19.26	16.38	13.64	382
1	1951	12.43	10.60	10.82	24.38	68.47	52.58	32.14	25.91	25.47	27.35	26.08	23.81	339
1	1952	24.43	17.61	23.87	17.60	34.67	41.45	49.30	43.31	40.48	36.11	40.58	34.57	404
1	1953	26.81	25.01	32.86	26.70	38.97	143.72	157.25	58.50	29.95	29.32	26.08	22.24	618
1	1954	22.74	24.40	24.47	26.13	84.27	207.07	314.90	50.92	34.46	37.82	38.75	34.57	900
1	1955	30.09	37.14	26.08	49.80	90.49	64.95	28.75	20.06	21.10	21.64	19.77	17.64	426
1	1956	14.67	12.75	11.89	12.63	14.36	43.52	50.36	28.45	23.19	19.26	14.58	14.29	260
1	1957	13.65	10.84	10.33	17.98	40.96	52.58	101.51	21.54	17.55	16.79	17.57	15.33	339
1	1958	12.73	12.75	12.16	10.52	14.36	96.71	147.47	43.31	22.15	18.87	16.77	15.33	423
1	1959	11.87	11.62	11.09	55.98	165.87	76.44	33.85	30.50	29.95	23.21	20.25	18.06	488
1	1960	13.36	14.65	12.76	19.28	78.45	86.27	45.90	36.76	27.90	21.15	18.86	17.64	393
1	1961	14.67	12.75	21.29	54.80	169.72	136.61	147.47	54.60	28.59	22.20	20.73	18.87	704
1	1962	16.06	12.45	11.62	27.27	124.76	293.24	92.44	47.53	36.09	29.96	26.08	22.24	739
1	1963	26.19	16.48	12.45	45.49	37.38	68.25	57.98	39.46	30.62	23.21	21.67	19.80	397
1	1964	17.23	12.45	15.35	14.91	17.45	35.31	31.44	23.61	21.62	21.64	20.25	19.33	249
1	1965	17.64	13.06	10.82	12.36	9.97	18.91	52.92	16.27	11.25	11.29	10.52	9.18	194
1	1966	8.98	11.62	11.33	17.60	10.74	53.70	76.99	43.31	28.59	22.20	18.86	14.29	319
1	1967	12.73	11.10	10.11	11.53	99.47	73.26	131.24	32.74	30.62	26.11	20.25	13.94	473
1	1968	11.60	10.60	41.42	22.15	45.98	110.82	71.40	35.05	14.90	11.53	14.92	10.56	402
1	1969	8.17	8.58	9.41	13.25	33.25	108.46	44.93	24.82	15.21	11.83	12.09	11.30	300
1	1970	8.76	8.99	8.97	12.63	40.96	133.68	74.91	27.88	13.91	12.38	12.09	11.05	367
1	1971	9.41	9.42	11.33	14.21	150.15	96.71	133.83	70.44	26.69	14.23	11.55	12.72	560
1	1972	11.87	11.10	11.89	15.23	293.66	369.84	116.66	27.88	12.37	14.23	19.31	13.31	917
1	1973	11.60	11.35	10.11	9.75	185.94	293.24	165.50	49.79	34.46	22.70	16.77	17.23	828
1	1974	18.45	11.90	12.45	24.38	84.27	280.43	193.87	50.92	32.10	24.90	27.95	20.72	781
1	1975	15.00	14.02	14.65	27.27	65.24	96.71	68.51	34.27	24.33	19.26	20.73	17.64	418
2	1940	3.98	3.97	3.88	6.50	21.29	10.26	5.62	5.13	4.36	3.97	3.98	3.97	77
2	1941	3.98	3.97	3.88	8.62	33.04	12.08	4.11	3.98	4.06	4.17	4.18	4.16	90
2	1942	4.17	4.06	4.06	4.58	18.87	34.33	34.31	22.37	4.17	4.08	4.18	4.16	142
2	1943	4.07	4.06	4.06	4.17	10.08	68.94	57.33	25.53	4.36	4.37	4.47	4.36	194
2	1944	4.37	4.36	4.06	4.58	11.05	8.39	16.27	5.63	4.59	4.48	4.57	4.58	77
2	1945	3.45	3.53	3.22	3.61	4.18	16.31	8.22	3.62	3.62	3.29	3.52	3.71	61
2	1946	3.29	3.15	3.62	30.94	91.37	22.53	7.00	1.34	4.48	3.97	3.87	3.71	179
2	1947	3.45	3.45	3.06	3.97	6.89	48.75	84.81	48.99	11.92	4.08	3.98	3.79	227
2	1948	3.70	3.78	3.29	3.79	108.99	147.91	70.38	9.24	3.14	2.85	3.14	3.14	363
2	1949	3.29	3.45	3.88	4.27	11.05 E	17.76 E	17.72 E	7.01 E	4.26 E	3.90 E	3.82 E	3.85 E	84
2	1950	3.62 E	3.36	3.45	3.97	7.26	16.13 E	33.66	3.88	3.06	3.70	4.18	4.58	91
2	1951	5.64 E	5.91 E	2.72	4.81	22.61	28.31 E	5.11	3.35	2.53	2.79	3.14	2.92	91
2	1952	2.79	2.14	2.59	3.61	14.67	46.47	47.66	7.14	2.53	2.53	2.72	2.65	140
2	1953	2.47	2.24	3.22	4.07	6.41	0.00	57.33	20.74	4.26	3.61	3.79	3.45	110
2	1954	3.61	2.65	3.06	3.61	36.13	60.01	95.45	10.36	5.16	4.57	4.18	3.79	233
2	1955	3.53	3.13	2.99	7.30	12.99	24.25	4.88	3.79	3.88	4.17	4.18	3.97	79
2	1956	3.70	2.99	2.99	2.99	3.27	11.50	19.68	4.56	2.79	3.29	2.92	3.06	64
2	1957	3.13	2.47	2.09	5.27	13.26	11.79	12.95	2.24	1.99	2.09	2.36	2.30	60
2	1958	2.53	2.92	3.53	3.45	3.20	5.47	12.59	2.78	2.42	2.19	2.14	2.36	45
2	1959	2.47	2.72	3.29	5.51	23.77	9.48	3.52	3.06	2.92	2.53	2.53	2.41	65

2	1960	2.92	3.62	3.88	3.71	11.05	31.39	15.22	51.44	22.27	2.99	2.72	2.65	154
2	1961	2.85	2.47	3.29	18.60	36.86	65.72	45.41	34.71	3.62	2.65	2.72	2.24	222
2	1962	2.85	2.66	2.59	3.29	24.99	75.57	62.60	13.12	4.17	3.29	2.85	2.85	202
2	1963	3.07	2.47	2.35	3.37	4.69	6.29	9.30	1.55	2.24	2.65	2.36	3.71	43
2	1964	4.90	5.80	6.06	5.27	2.39	8.05	4.97	2.46	3.29	4.08	3.79	3.37	53
2	1965	3.61	3.06	2.85	2.30	2.16	2.21	6.80	3.62	3.62	3.88	3.98	3.45	42
2	1966	1.45	2.59	2.92	3.61	5.43	24.25	37.78	7.68	5.26	5.40	5.14	4.68	106
2	1967	4.17	5.67	5.02	5.03	12.10	13.77	18.41	7.14	7.29	6.81	6.34	5.15	96
2	1968	6.21	5.80	5.51	6.22	7.04	7.83	8.06	5.93	7.67	9.02	9.04	7.32	86
2	1969	3.29	3.53	3.37	4.69	16.39	19.68	17.06	7.34	6.34	6.08	5.64	5.64	99
2	1970	5.64	4.70	3.70	3.21	11.05	20.07	5.62	4.45	3.21	4.27	3.28	3.53	73
2	1971	3.07	3.45	6.22	4.81	0.96	26.02	51.01	12.48	6.05	6.37	7.49	7.32	133
2	1972	6.83	7.67	4.17	5.27	14.82 E	18.90 E	81.54 E	14.66 E	14.77 E	12.00 E	12.16 E	11.51 E	206
2	1973	9.93	9.00	10.84	8.04	27.34	18.70	18.41	8.82	10.41	11.38	17.25	15.08	164
2	1974	10.16	7.67	8.41	9.66	10.50	18.70	28.58	6.59 E	13.73	11.38	10.40	12.74	149
2	1975	15.38	14.71	14.01	14.40	17.24	10.39	17.06	13.12	14.37	13.72	11.37	10.36	164
3	1940	0.38 E	0.33 E	0.37 E	1.73 E	1.79 E	0.94 E	0.57 E	0.25 E	0.52 E	0.39 E	0.25 E	0.19 E	7
3	1941	0.20 E	0.30 E	0.31 E	0.35 E	0.99 E	0.53 E	0.81 E	0.16 E	0.49 E	0.37 E	0.62 E	0.40 E	4
3	1942	0.18 E	0.50 E	0.37 E	1.00 E	1.25 E	1.54 E	1.28 E	0.89 E	0.33 E	0.24 E	0.27 E	0.27 E	7
3	1943	0.40 E	0.43 E	0.42 E	0.67 E	0.65 E	2.42 E	5.67	3.55	2.29	1.48 E	1.95	1.84	21
3	1944	0.71	0.77	0.86	1.52	4.87	0.34	5.78	0.65	0.42	0.51	0.83	0.86	19
3	1945	0.53	0.43	0.36	0.00	0.00	2.34	1.66	0.86	0.72	0.66	0.25	0.11	8
3	1946	0.16	0.19	0.20	2.70	10.38	0.35	0.00	0.00	0.00	0.00	0.18	0.26	13
3	1947	0.22	0.16	0.17	0.00	0.00	0.00	5.15	4.78	2.29	0.48	0.40	0.30	12
3	1948	0.24	0.25	0.25	0.00	2.02 E	9.14 E	9.13 E	1.25 E	0.19 E	0.15 E	0.19 E	0.21 E	21
3	1949	0.32 E	0.00	0.00	0.19	0.41 E	1.09 E	0.65 E	0.48 E	0.46 E	0.35 E	0.20 E	0.19 E	2
3	1950	0.29 E	0.37 E	0.28	0.00	0.00	0.54 E	2.24	0.81	0.15	0.00	0.00	0.00	4
3	1951	0.43 E	0.63 E	0.42	1.35	1.34	0.79 E	0.00	0.00	0.61	0.59	0.37	0.16	6
3	1952	0.54	0.28	0.21	0.34	0.56	0.52	1.42	0.04	0.19	59	0.66	0.14	6
3	1953	0.20	0.35	0.37	0.35	0.54	3.95	0.00	0.61	0.99	.54	0.33	1.03	9
3	1954	0.90	0.92	0.97	0.52	0.78	4.48	15.81	0.86	0.19	0.44	0.73	0.51	26
3	1955	0.58	0.48	0.42	1.00	1.25	2.70	0.00	0.36	0.38	0.51	0.46	0.45	7
3	1956	0.40	0.51	0.58	0.58	0.00	0.00	0.02	0.86	0.70	0.49	0.57	0.58	7
3	1957	0.61	0.50	0.52	0.49	1.64	3.12	2.20	0.22	0.25	0.61	0.55	0.58	13
3	1958	0.56	0.58	0.36	0.00	0.00	0.00	3.18	0.29	0.13	0.04	0.05	0.00	5
3	1959	0.08	0.28	0.54	1.49	7.29	0.00	0.00	0.00	1.38	1.24	1.12	1.22	13
3	1960	1.07	0.51	0.37	0.00	0.00	3.54	1.95	0.00	0.00	0.00	0.00	0.00	8
3	1961	0.00	0.40	0.23	2.60	0.00	0.00	0.00	0.03	0.46	0.49	0.15	0.18	3
3	1962	0.27	0.14	0.30	0.00	5.67	17.82	10.83	0.86	0.00	0.00	0.00	0.35	36
3	1963	0.48	0.30	0.26	1.32	0.73	0.17	3.06	1.98	0.94	0.51	0.41	0.00	9
3	1964	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0
3	1965	0.06	0.87	1.26	1.02	1.18	0.01	0.00	0.00	1.99	1.82	0.83	0.15	9
3	1966	0.00	1.08	0.18	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	1
3	1967	0.00	0.00	0.00	0.88	1.56	0.90	7.55	0.89	2.09	4.16	4.91	3.00	27
3	1968	1.10	0.46	0.79	1.80	0.69	0.74	0.00	1.69	0.99	0.00	0.00	0.71	10
3	1969	2.23	1.89	2.37	0.59	0.87	0.00	0.27	0.00	0.00	0.00	0.00	0.00	8
3	1970	0.00	0.34	3.43	3.36	0.47	4.17	0.00	0.78	4.19	4.27	4.91	4.57	29
3	1971	4.70	4.36	0.00	0.00	0.00	0.00	2.94	1.51	1.34	0.89	0.95	0.97	18
3	1972	0.77	0.00	3.12	2.34	4.26	6.94	5.78	0.00	0.00	0.00	0.00	0.00	23
3	1973	0.00	0.00	0.00	0.88	9.07	4.65	0.57	0.95 E	2.78	1.48	0.00	0.00	21
3	1974	2.98	5.54	5.30	5.16	7.17	16.53	11.04	1.47 E	3.38	4.05	4.46	3.23	69
3	1975	4.68 E	1.40 E	0.97 E	3.67 E	3.25 E	2.21 E	0.76 E	0.50 E	0.31 E	0.03 E	0.00 E	0.00 E	17
4	1940	4.48 E	5.60 E	7.26 E	7.61 E	31.90 E	35.72 E	38.54 E	9.85 E	9.32 E	8.37 E	6.94 E	6.28 E	172
4	1941	4.54 E	6.20 E	1.19 E	5.46 E	41.84 E	33.80 E	36.58 E	6.06 E	7.53 E	8.37 E	6.96 E	9.16 E	168
4	1942	6.58 E	7.88 E	4.53 E	5.90 E	40.36 E	53.99 E	47.90 E	25.42 E	14.06 E	7.51 E	6.50 E	6.57 E	228
4	1943	5.15 E	5.88 E	6.73 E	8.53 E	25.99 E	63.77 E	50.68 E	12.36 E	10.65 E	8.37 E	7.03 E	6.66 E	213
4	1944	6.58 E	6.56 E	10.40 E	21.64 E	32.38 E	79.55 E	43.00 E	23.46 E	13.74 E	8.27 E	6.84 E	6.09 E	259

ADJUSTED FREQUENCY STATISTICS

STA	ITEM	9	10	11	12	1	2	3	4	5	6	7	8
1	MEAN	1.131	1.094	1.113	1.292	1.729	1.944	1.642	1.523	1.373	1.297	1.268	1.200
	STD DEV	0.151	0.140	0.175	0.230	0.350	0.305	0.296	0.198	0.161	0.146	0.145	0.139
	SKEW	0.572	1.546	1.156	0.001	-0.117	0.090	-0.163	-0.906	-1.044	-0.466	0.098	0.311
	INCRMT	0.14	0.13	0.14	0.22	0.72	1.11	0.86	0.36	0.25	0.21	0.19	0.17
2	MEAN	0.604	0.597	0.596	0.719	1.073	1.240	1.273	0.857	0.688	0.645	0.644	0.634
	STD DEV	0.188	0.180	0.171	0.226	0.421	0.474	0.422	0.385	0.251	0.206	0.212	0.204
	SKEW	1.159	1.263	1.626	1.742	-0.041	-1.387	0.055	0.506	0.997	0.976	1.163	1.230
	INCRMT	0.10	0.10	0.10	0.10	0.19	0.28	0.27	0.11	0.10	0.10	0.10	0.10
3	MEAN	-0.334	-0.302	-0.301	-0.223	-0.092	-0.043	-0.046	-0.309	-0.263	-0.347	-0.395	-0.425
	STD DEV	0.454	0.408	0.424	0.560	0.666	0.705	0.772	0.498	0.494	0.506	0.507	0.484
	SKEW	0.395	0.316	0.396	-0.268	-0.123	-0.004	-0.074	-0.090	-0.041	0.176	0.510	0.498
	INCRMT	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
4	MEAN	0.717	0.765	0.886	1.154	1.567	1.792	1.699	1.371	1.119	0.916	0.835	0.777
	STD DEV	0.143	0.150	0.244	0.274	0.323	0.257	0.220	0.259	0.217	0.101	0.096	0.107
	SKEW	0.621	-0.161	-0.589	0.732	-0.241	0.452	-0.011	0.021	1.194	0.627	0.058	0.067
	INCRMT	0.10	0.10	0.10	0.18	0.48	0.81	0.61	0.32	0.16	0.10	0.10	0.10
5	MEAN	1.214	1.278	1.340	1.464	1.979	2.168	2.227	1.806	1.502	1.353	1.275	1.250
	STD DEV	0.129	0.091	0.140	0.252	0.290	0.179	0.207	0.184	0.132	0.085	0.073	0.119
	SKEW	0.171	2.078	0.047	0.246	-0.721	0.373	-1.120	-0.039	0.309	-1.060	-1.136	2.024
	INCRMT	0.18	0.19	0.23	0.36	1.10	1.93	2.02	0.73	0.34	0.23*	0.19	0.18
6	MEAN	1.512	1.502	1.470	1.708	2.122	2.291	2.325	1.989	1.804	1.647	1.590	1.536
	STD DEV	0.115	0.125	0.212	0.193	0.288	0.201	0.214	0.220	0.180	0.132	0.126	0.103
	SKEW	-1.365	-1.254	-2.807	1.799	-0.601	-0.097	-0.112	-0.374	-0.205	-0.799	-0.651	-1.478
	INCRMT	0.32	0.31	0.32	0.55	1.57	2.36	2.44	1.07	0.66	0.45	0.40	0.35

NO. OF INDEPENDENT VARIABLES - NINDP

		- - MONTHS - -											
YEAR= 1													
STATION	1	4	5	5	5	3	5	5	5	4	5	5	5
STATION	2	3	5	5	5	5	5	5	4	5	5	2	4
STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 2													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 3													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	0	0	0	0	0	0	0	0	0	0	0	0
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 4													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	0	0	0	0	0	0	4	5	5	0	5	5
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	0	0	0	0	0	0	0	0	0	0	0	0
YEAR= 5													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	5	5	5	5	4	5	4	5	5	4	5	5
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 6													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	5	5	5	5	4	5	4	5	5	4	5	5
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 7													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	5	5	5	5	4	5	4	5	5	4	5	5
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	2	5	5	5	2	4	4	4	3	4	2	3
YEAR= 8													
STATION	1	5	5	5	5	3	5	5	5	4	5	5	5
STATION	2	4	5	5	5	5	5	5	4	5	5	2	4
STATION	3	5	5	5	5	4	5	4	5	5	4	5	5
STATION	4	0	0	0	0	0	0	0	0	0	0	0	0
STATION	5	0	0	0	0	0	0	0	0	0	0	0	0
STATION	6	2	5	5	5	2	4	4	4	3	4	2	3