Chapter 5

Introduction 102

Logical Design of Simulation Program 107

Simulation Flowchart (Model) 108

Sample of Simulated Data List 166

Analysis Report of Simulated Data 171

Simulated Data Graphs 175

Introduction

Simulation is the technique of imitating the behavior of any system under study. It is an experimental technique, fast and relatively inexpensive. Problem solution is achieved by designing, constructing and manipulating a model of the real system.

With the introduction of digital computers, simulation has found a great number of applications in various fields. Computers enable system studies that are faster, more reliable and cheaper than any other method. Simulation is especially popular in situations where observations of a real-life system are not practical. This impracticality may be due to various reasons like cost, time or when the system under study is hazardous.

Simulation allows all combinations of variables and their subsequent effect on the entire system. Repeating the experiment several times often reveals bottleneck (congestion) activities. The computer increase the speed at which simulations can be run, eliminates much human error and allows iterations as many times as required.

The Kolhapur Reservation System was studied using the simulation techniques designed for discrete events. An event-to-event model was designed and a computer program then written to accept sample data. The program calculates statistics on bothsample and generated data. Numerical tables and bar graphs form the output reports from the program.

Logical Design of Simulation Program

The computer language used to develop the program is Microsoft Quick BASIC. It is an advanced form of BASIC. Logical design, simulation flowchart, and source program listing are available in this section.

The program is developed for Multi Queue Multi Server type of queuing problem. It can also be used for Single Server Single Queue type. The program also handles situations in which multiple counters offer multiple or same service. It does not cover Multi Stage Server simulation.

Program listing includes list of variables and their usage. This shows all the variables used in the program.

Program operation is as follows:

Arrival, departure and call times (of sample data) are fed into the computer via the keyboard. This is done after replying to questions asked by the program. These questions relate to volume of sample data collected: number of weeks, starting date, number of counters, number of working days, etc.

The next step is to obtain a list of the limits of arrival gaps, service times and counter numbers via option 3 of the program. At this stage, selecting option 5 simulates the system. After answering further questions (required duration of simulation, starting date, etc.), graphs, lists of sample data, analysis report and queue length can be obtained by selecting the respective options displayed on the screen at each stage.

List of main menu options are as follows:-

Option 1. Sample Data Entries

a) Fresh Entry

b) Continuation of Previous Entry

Option 2. List of Data

a) On Screen

i. Sample Data

ii. Simulated Data

b) On Printer

i. Sample Data

ii. Simulated Data

Option 3. List of Limits of

a) Service time

b) Arrival gaps

c) Counter Number

Option 4. Length of Queues

Generated report provides maximum length of queue and average length of queues for each individual counter.

Option 5. Simulation

This option simulates the model built by the computer for any length of time. Length of time is stated in number of weeks from a given date; generated data is stored in various files.

Option 6. Graphs

Graphs of arrival gaps, service times and arrival patterns can be obtained. This thesis only included arrival patterns for individual counters.

Option 7. Analysis of Data

This option generates a report on statistical measures which include average arrivals per

day, average waiting time per customer, average arrival gap, average service time, traffic intensity and server utilization for individual counters.

Sample Data Files are as follows:-

MASTDAT.FIL: This file contains information on office timings, type of counter operations, duration of sample data collection and number of working days. Recording format of time is in seconds.

MASTFIL.FIL This file contains the above information relating to the system. Time format is HH:MM:SS (Hours:Minutes:Seconds).

SAMARGAP.FIL Contains data on the number of people that arrived with various time gaps on different days of the week.

SAMSER.FIL Contains data on number of people served, with various service times on different days of the week.

SAMTDAT.FIL Contains cumulative information on total waiting times of all customers in the system for individual counters, total service times, total arrival gaps and total counter idle times.

SAMPNO1.FIL Contains total number of arrivals per day of the week for all weeks added up for all counters in the system.

SAMPNO2.FIL Contains total number of arrivals per day of the week for all weeks, for individual counters.

SAMPNO3.FIL Contains total number of arrivals per hours of all days of a week, for all weeks at individual counters.

SAMPNO4.FIL Contains information on total number of arrivals per hours of the day for all weeks for all counters.

SAMPNO5.FIL Contains information on total number of arrivals per hours, of the day of the week, for all weeks taking all counters together.

TABLEDAT.FIL Contains information on sample data: arrival, departure and call times, customer number, counter number and date. Time is recorded in HH:MM:SS format.

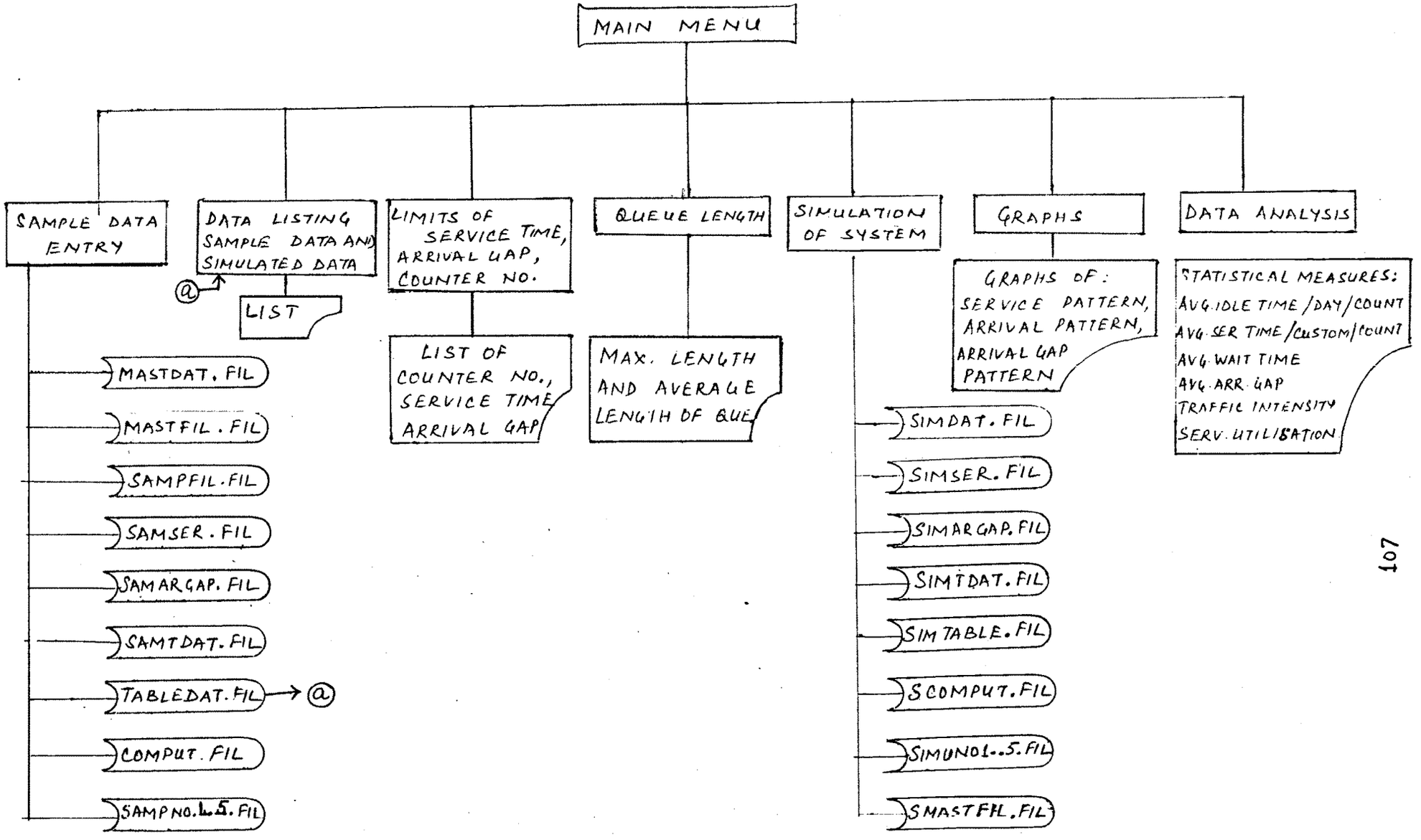
SAMDAT.FIL Contains the above information, recorded in seconds.

COMPUT.FIL This file contains information on waiting, service and counter idle times, counter number and customer number. Time is recorded in seconds.

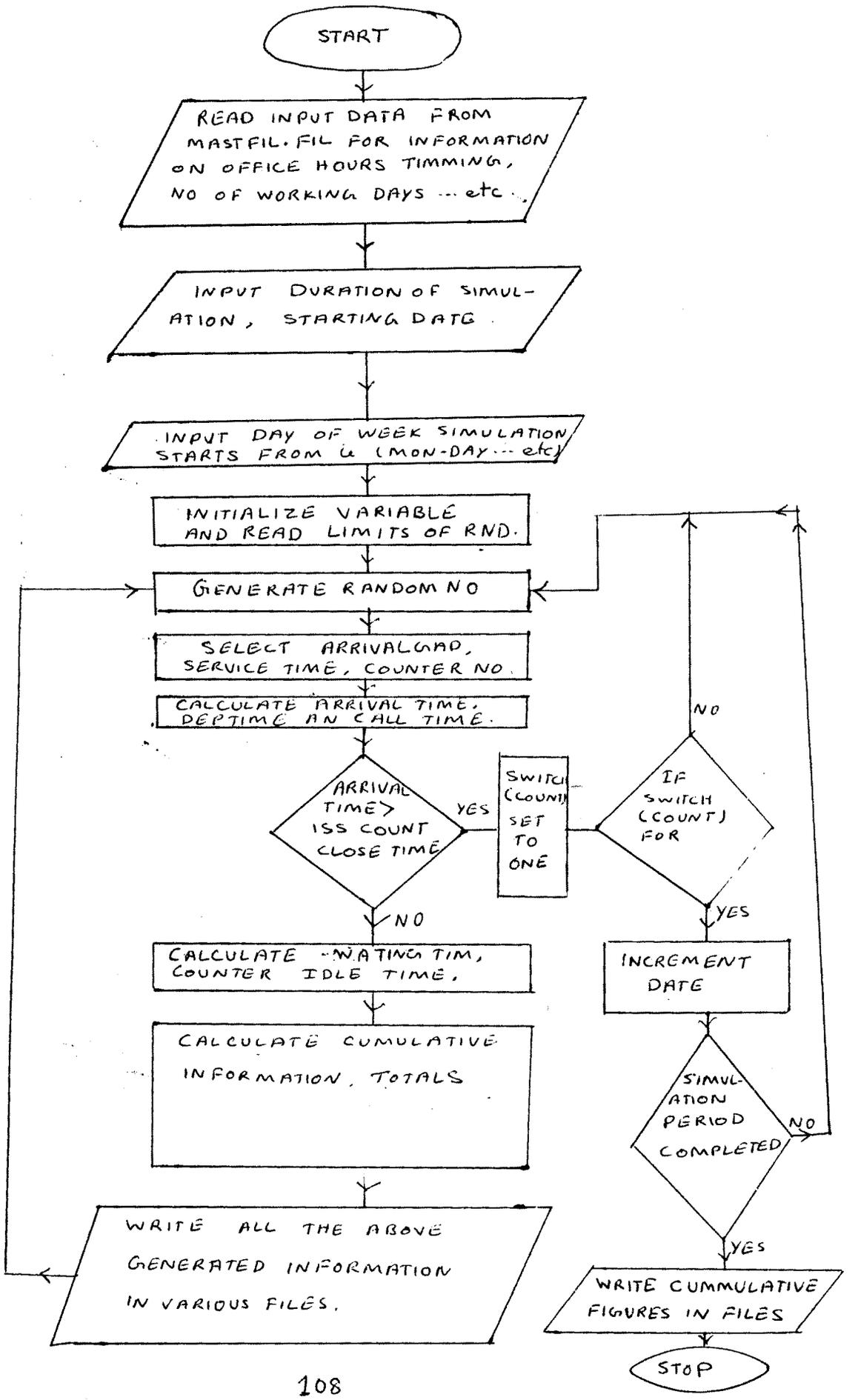
These files are used by the computer to generate reports, graphs and lists at several stages during and after the simulation. Repeated data entry is therefore not required.

There are similar files generated by the computer which contain simulated data. This data has the same format as sample data files.

LOGICAL DESIGN



FLOW CHART OF SIMULATION OF SYSTEM



```
                SIMULATION OF QUEUING SYSTEM
              ********************************
    THIS PROGRAM IS DESIGNED FOR SINGLE SERVICE SINGLE SERVER
  ************************************************************
    MULTI QUE MULTI SERVER (FOR ONLY SINGLE STAGE OF SERVICE)
 ************************************************************

          ***********************************************
          *                PROGRAM DEVELOPED            *
          *                      BY                     *
          *           ABBAS JANAT MAKAN SHAD            *
          *                                             *
          *                UNDER GUIDANCE               *
          *                      OF                     *
          *              DR. R. V. KULKARNI             *
          ***********************************************

************************ LIST OF VARIABLES USED ************************
*     A11 =TOKEN COUNTER STARTING TIME IN HOURS IF ANY                 *
*     A12 =TOKEN COUNTER CLOSING TIME IN HOURS IF ANY                  *
*     A13 =ISSUE COUNTER'S STARTING TIME IN HOURS                      *
*     A14 =ISSUE COUNTER'S CLOSING TIME IN HOURS                       *
*     A15 =LUNCH HOUR STARTING TIME IN HOUR                            *
*     A16 =LUNCH HOUR FINISHING TIME IN HOUR                           *
*     TCSTIM  =TOKEN COUNT STARTING TIME IN SECONDS IF ANY             *
*     TCCTIM  =TOKEN COUNTER CLOSING TIME IN SECONDS IF ANY            *
*     ISCSTIM =ISSUE COUNTER'S STARTING TIME IN SECONDS                *
*     ISCCTIM =ISSUE COUNTER'S CLOSING TIME IN SECONDS                 *
*     LUNSTIM =LUNCH HOURS STARTING TIME IN SECONDS                    *
*     LUNFTIM =LUNCH HOURS FINISHING TIME IN SECONDS                   *
*     NOCOUNT =NO. OF EXISTING COUNTERS                                *
*     NOWKS   =NO. OF WEEKS DATA COLLECTED FOR THE SYSTEM              *
*     DIFF =DEVIATION OF STARTING DAY OF SAMPLING FROM MONDAY          *
*     WKDAY$=NAME OF THE DAY SAMPLING STARTED eg.MON-DAY               *
*     CUSTNO = CUSTOMER NO. FOR A PARTICULAR COUNTER                   *
*     DAY =WEEK DAY IN NUMERIC eg. MONDAY=1                            *
*     DT$ =DATE FOR WHICH SAMPLE DATA COLLECTED                        *
*     CNT =COUNTER NO TO WHICH CUSTOMER GOES                           *
*     A21 =ARRIVAL TIME IN HOURS                                       *
*     A22 =THE TIME CUSTOMER STARTED TO BE SERVICED IN HOURS           *
*     A23 =CUSTOMER DEPT.TIME IN HOURS                                 *
*     ARTIM   =ARRIVAL TIME IN SECONDS                                 *
*     CALTIM = THE TIME CUSTOMER STARTED TO BE SERVICED IN SECONDS     *
*     DEPTIM =CUSTOMER DEPT.TIME IN SECONDS                            *
*     WATIM   =CUSTOMER WATIG TIME IN SECONDS                          *
*     SERTIM =SERVICE TIME IN SECONDS                                  *
*     ARGAP   =ARRIVAL GAP IN SECONDS                                  *
*     FRCTIM =COUNTER'S IDLE TIME IN SECONDS                           *
*     LMTS(35,5,7)=SUBSCRIPT VARIABLE FOR LIMITS OF SERVICE TIME       *
*     LMTC(5,7)    =SUBSCRIPT VARIABLE FOR LIMITS OF ISSUE COUNTER     *
*     LMTG(45,5,7)=SUBSCRIPT VARIABLE FOR LIMITS OF AR.GAP TIME        *
*     THE FOLOWING S.VARIABLES ARE USED FOR INTERNAL CALCULATIONS      *
*     TOT(7,35)   ,  TOTA(35)                                          *
*     GTOTA(20)   ,  AN1%(20) ,  GL1%(20)   , TOTL(35,5)               *
*     TONOARGP(45,5,7) , TOTNOSER(35,5,7) , TOTWATM(5)                 *
*     TTTOT(35,5) , TOTSERTM(5) , SCUSTNO(5)                           *
*     TOTSER(35), TOTARGP(5), X2$(3), SDEPT(5) ,  A(3)                 *
*     SPDEPT(5)   ,  SPTIM(5) , PDEPT(5) , TOTFRCTIM(5)                *
************************************************************************
```

```
'              ************************************************
'              *                                              *
'              *                                              *
'              *                MAIN PROGRAM                  *
'              *                                              *
'              *                                              *
'              ************************************************

     DIM LMTS(1 TO 35, 1 TO 5, 1 TO 7), LMTC(1 TO 5, 1 TO 7), LNG(1 TO 5)
     DIM TOT(1 TO 7, 1 TO 35), TOTA(1 TO 35)
     DIM GTOTA(1 TO 45), AN1%(1 TO 45), GL1%(1 TO 45), TT3%(1 TO 5, 1 TO 7)
     DIM TOTL(1 TO 35, 1 TO 5), LMTG(1 TO 45, 1 TO 5, 1 TO 7)
     DIM TONOARGP(1 TO 45, 1 TO 5, 1 TO 7), TOTNOSER(1 TO 35, 1 TO 5, 1 TO 7)
     DIM TOTARGP(1 TO 5), A(1 TO 3), X2$(1 TO 3), SDEPT(1 TO 45)
     DIM TOTSER(1 TO 5), SCUSTNO(1 TO 5), TT4%(1 TO 5, 1 TO 7)
     DIM SPDEPT(1 TO 5), SPTIM(1 TO 5), PDEPT(1 TO 5), TOTFCTM(1 TO 5)
     DIM TOTWATM(1 TO 5), TTTOT(1 TO 35, 1 TO 5), AB(10)
     TCSTIM = 0: TCCTIM = 0
     TCSTIM = 0: TCCTIM = 0
     CLS : X = 7: Y = 10: Z = 11: W = 60
     GOSUB 6000: REM SUB.FOR DRAWING SCREEN BOX**************
     LOCATE 9, 23: PRINT "              WELCOME TO "
     LOCATE 10, 23: PRINT "          *****************"
     LOCATE 12, 23: PRINT "    SIMULATION OF QUEUING SYSTEM"
     LOCATE 13, 23: PRINT "************************************"
     LOCATE 15, 23: PRINT "            BY A.J.M.SHAD"
     LOCATE 16, 23: PRINT "         ******************"
40   REM  MAIN MENU ***************************************************************
41   CLS : X = 4: Y = 12: Z = 16: W = 60
     GOSUB 6000: REM SUB.FOR DRAWING SCREEN BOX**************
     LOCATE 2, 24: PRINT "SIMULATION OF QUEUING SYSTEM MAIN MENU"
     LOCATE 3, 21: PRINT "****************************************"
     LOCATE 5, 18: PRINT "1].       SAMPLE DATA ENTRIES"
     LOCATE 7, 18: PRINT "2].       LISTING OF  DATA"
     LOCATE 9, 18: PRINT "3].       LISTING OF  LIMITS"
     LOCATE 11, 18: PRINT "4].       QUEUE LENGTH"
     LOCATE 13, 18: PRINT "5].       SIMULATION  OF SYSTEM"
     LOCATE 15, 18: PRINT "6].       GRAPH"
     LOCATE 17, 18: PRINT "7].       DATA ANALYSIS"
     LOCATE 19, 18: PRINT "8].       EXIT FROM SYSTEM"
     LOCATE 21, 27: PRINT "SELECT 1 TO 8 FROM MENU"
45   X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 50
     IF X$ = "2" THEN 8000
     IF X$ = "3" THEN 5000
     IF X$ = "4" THEN 4700
     IF X$ = "5" THEN 3000
     IF X$ = "6" THEN 9000
     IF X$ = "7" THEN 7000
     IF X$ = "8" THEN CLOSE : END
     GOTO 45
50   CLS : X = 9: Y = 9: Z = 9: W = 67
     GOSUB 6000: REM SUB.FOR DRAWING SCREEN BOX**************
     LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
     LOCATE 12, 18: PRINT "         HAVE YOU ENTERED DATA EARLIER"
     LOCATE 15, 17
     PRINT "PRESS Y IF YES AND N IF NOT AND X TO EXIT TO MAIN MENU"
```

```
90    X$ = "": X$ = INKEY$
      IF X$ = "Y" OR X$ = "y" THEN 10000: REM CONTINUATION OF SAMPLE DATA ENTRY
      IF X$ = "N" OR X$ = "n" THEN 100
      IF X$ = "X" OR X$ = "x" THEN 41
      GOTO 90
100   CLS : X = 9: Y = 9: Z = 9: W = 67
      GOSUB 6000: REM SUB.FOR DRAWING SCREEN BOX**************
      LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
      LOCATE 12, 18: PRINT "DOES THE QUEUING SYSTEM WORK ON TOKEN SYSTEM ?"
      LOCATE 15, 17: PRINT "PRESS Y IF YES, N IF NOT AND X TO EXIT TO MAIN MENU"
110   X$ = "": X$ = INKEY$
      IF X$ = "Y" OR X$ = "y" THEN 130
      IF X$ = "N" OR X$ = "n" THEN 100
      IF X$ = "X" OR X$ = "x" THEN 41
      GOTO 110
130   CLS : X = 9: Y = 5: Z = 7: W = 70: GOSUB 6000
      LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
131   LOCATE 11, 12: INPUT "ENTER TOKEN COUNTER STARTING TIME:"; TCSTIM
      A11 = TCSTIM
      TMPTM = TCSTIM: GOSUB 11000: TCSTIM = TMPTM: IF FLAG$ = "F" THEN 131
132   LOCATE 13, 12: INPUT "ENTER TOKEN COUNTER CLOSING TIME:"; TCCTIM
      TMPTM = TCCTIM: GOSUB 12000: IF FLAG$ = "F" THEN 131
      LOCATE 13, 46: PRINT " "; : PRINT USING "##.##"; TMPTM; : PRINT "   "
      A12 = TMPTM
      GOSUB 11000:  TCCTIM = TMPTM: IF FLAG$ = "F" THEN 132
      LOCATE 17, 12
      PRINT "PRESS Y IF ENTRIES ARE CORRECT,N IF NOT & X TO EXIT TO MAIN MENU"
170 X$ = "": X$ = INKEY$
      IF X$ = "Y" OR X$ = "y" THEN 120
      IF X$ = "N" OR X$ = "n" THEN 130
      IF X$ = "X" OR X$ = "x" THEN 41
      GOTO 170

120   CLS : X = 9: Y = 9: Z = 8: W = 67: GOSUB 6000
      LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
      LOCATE 11, 11: INPUT "ENTER NO OF SERVICING COUNTER"; NOCOUNT
121   LOCATE 13, 11
      INPUT "DO COUNTERS PERFORM SAME FUNCTION (Y FOR YES N FOR NO.)"; TYPE$
      IF TYPE$ = "N" OR TYPE$ = "n" THEN 122
      IF TYPE$ = "y" OR TYPE$ = "Y" THEN 122
      GOTO 121
122   LOCATE 15, 11: INPUT "ENTER NO OF WORKING DAYS IN A WEEK"; NOWDYS
      LOCATE 18, 16
      PRINT "PRESS Y IF ENTRIES ARE CORRECT ,N IF NOT & X TO EXIT TO MAIN MENU"
125 X$ = "": X$ = INKEY$
      IF X$ = "Y" OR X$ = "y" THEN 185
      IF X$ = "N" OR X$ = "n" THEN 120
      IF X$ = "X" OR X$ = "x" THEN 41
      GOTO 125
185   CLS : X = 7: Y = 5: Z = 10: W = 70: GOSUB 6000
      LOCATE 5, 20: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
186   LOCATE 9, 12: INPUT "ENTER ISSUE COUNTER STARTING TIME:"; ISCSTIM
      A13 = ISCSTIM
      TMPTM = ISCSTIM: GOSUB 11000: ISCSTIM = TMPTM: IF FLAG$ = "F" THEN 186
188   LOCATE 11, 12: INPUT "ENTER ISSUE COUNTER CLOSING TIME:"; ISCCTIM
      TMPTM = ISCCTIM: GOSUB 12000: IF FLAG$ = "F" THEN 188
      LOCATE 11, 45: PRINT USING "##.##"; TMPTM; : PRINT "  ": A14 = TMPTM
      GOSUB 11000: ISCCTIM = TMPTM: IF FLAG$ = "F" THEN 188
```

```
189  LOCATE 13, 12: INPUT "ENTER LUNCH HOUR STARTING TIME:"; LUNSTIM
     TMPTM = LUNSTIM: GOSUB 12000: IF FLAG$ = "F" THEN 189
     LOCATE 13, 43: PRINT USING "##.##"; TMPTM; : PRINT "  ": A15 = TMPTM
     GOSUB 11000: LUNSTIM = TMPTM: IF FLAG$ = "F" THEN 189
191  LOCATE 15, 12: INPUT "ENTER LUNCH HOUR FINISHING TIME:"; LUNFTIM
     TMPTM = LUNFTIM: GOSUB 12000: IF FLAG$ = "F" THEN 191
     LOCATE 15, 44: PRINT USING "##.##"; TMPTM; : PRINT "   ": A16 = TMPTM
     GOSUB 11000: LUNFTIM = TMPTM: IF FLAG$ = "F" THEN 191
     LOCATE 19, 12
     PRINT "PRESS Y IF ENTRIES ARE CORRECT,N IF NOT & X TO EXIT TO MAIN MENU"
187  X$ = "": X$ = INKEY$
     IF X$ = "Y" OR X$ = "y" THEN 175
     IF X$ = "N" OR X$ = "n" THEN 185
     IF X$ = "X" OR X$ = "x" THEN 41
     GOTO 187

175  CLS : X = 9: Y = 9: Z = 6: W = 67: GOSUB 6000
     LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
     LOCATE 12, 11
     PRINT "WHICH DAY OF THE WEEK SAMPLING STARTED IN ALPHABETIC:"
     LOCATE 12, 64: INPUT WKDAY$: WKDAY$ = LEFT$(WKDAY$, 3) + "-DAY": GOSUB 4100
     IF FLGT$ = "F" THEN 175
     LOCATE 12, 64: PRINT " "; WKDAY$; "   "
     INPUT "FOR HOW MANY WEEKS SAMPLE TAKEN :"; NOWKS
     LOCATE 16, 27: PRINT "PRESS Y IF YES ,N IF NOT AND X TO EXIT TO MAIN MENU"
177  X$ = "": X$ = INKEY$
     IF X$ = "Y" OR X$ = "y" THEN 180
     IF X$ = "N" OR X$ = "n" THEN 175
     IF X$ = "X" OR X$ = "x" THEN 41
     GOTO 177
180  REM CREATION OF MASTER FILES ***********************************************
'    MASTDAT.FIL CONTAINS THE INFORMATION REGARDING TO SYSTEM'S
'    OPERATION WITH TIME IN SECONDS
'    MASTFIL.FIL CONTAINS THE INFORMATION REGARDING TO SYSTEM'S
'    OPERATION WITH TIME IN HOURS
     OPEN "MASTDAT.FIL" FOR OUTPUT AS #3
     OPEN "MASTFIL.FIL" FOR OUTPUT AS #4
     WRITE #3, TCSTIM, TCCTIM, ISCSTIM, ISCCTIM, LUNSTIM, LUNFTIM, NOCOUNT, WKDA
Y$, DIFF, NOWKS, NOWDYS, TYPE$
     WRITE #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS, NOWDY
S, TYPE$
     CLOSE #3, #4
     GOSUB 4000
     GOSUB 4600
     DAY = 1
     CNT = 1: GOSUB 16000
1080 CUSTNO = 0: K = 0: IF DAY > NOWDYS THEN DAY = 1
     PDEPT = ISCSTIM
     IF TCSTIM > 0 THEN PTIM = TCSTIM
     IF TCSTIM <= 0 THEN PTIM = ISCSTIM
1120 CLS : CUSTNO = CUSTNO + 1
1130 CLS : X = 8: Y = 5: Z = 9: W = 70: GOSUB 6000
     LOCATE 5, 23: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
     LOCATE 6, 20: PRINT "*******************************************"
     LOCATE 7, 60: PRINT "DATA OF "; DT$;
     LOCATE 10, 12: PRINT "CUST.NO.:"; CUSTNO
     LOCATE 10, 60: PRINT "COUNTER NO"; CNT
1131 LOCATE 12, 12: INPUT "ARRTIME OF CUST.:"; ARTIM: TMPTM = ARTIM
     GOSUB 12000: IF FLAG$ = "F" THEN 1131
     LOCATE 12, 29: PRINT USING "##.####"; TMPTM; : PRINT "  ": A21 = TMPTM
     GOSUB 11000: ARTIM = TMPTM: IF FLAG$ = "F" THEN 1131
     IF (PTIM > ARTIM OR ARTIM > ISCCTIM) THEN LOCATE 12, 29: PRINT "          ":
 GOTO 1131
```

```
     IF TCSTIM > 0 AND ARTIM < TCSTIM THEN 1131
     IF TCSTIM = 0 AND ARTIM < ISCSTIM THEN 1131
     IF ARTIM >= LUNSTIM AND ARTIM < LUNFTIM THEN LOCATE 14, 13
                                        : PRINT "LUNCH HOUR ERROR": GOTO 1131
1132 LOCATE 14, 12: INPUT "CALL TIME OF CUST.:"; CALTIM: TMPTM = CALTIM
     GOSUB 12000: IF FLAG$ = "F" THEN 1132
     LOCATE 14, 31: PRINT USING "##.####"; TMPTM; : PRINT "    ": A22 = TMPTM
     GOSUB 11000: CALTIM = TMPTM: IF FLAG$ = "F" THEN 1132
     IF CALTIM >= PDEPT THEN 1133
     LOCATE 14, 31: PRINT "          ": LOCATE 16, 13: PRINT "CAL TIME ERROR"
     GOTO 1132
1133 LOCATE 16, 12: INPUT "DEPARTURE TIME OF CUST.:"; DEPTIM: TMPTM = DEPTIM
     GOSUB 12000: IF FLAG$ = "F" THEN 1133
     LOCATE 16, 37: PRINT USING "##.####"; TMPTM; : PRINT "  ": A23 = TMPTM
     GOSUB 11000: DEPTIM = TMPTM: IF FLAG$ = "F" THEN 1133
     IF CALTIM > DEPTIM THEN LOCATE 16, 37: PRINT "          ": GOTO 1133
     LOCATE 19, 12: PRINT "PRESS Y IF ENTRIES ARE CORRECT AND N IF NOT"
1135 X$ = "": X$ = INKEY$
     IF X$ = "Y" OR X$ = "y" THEN 1138
     IF X$ = "N" OR X$ = "n" THEN 1130
     GOTO 1135
1138 IF ARTIM > LUNSTIM AND PTIM < LUNFTIM THEN PTIM = LUNFTIM
     ARGAP = ARTIM - PTIM: IF ARGAP < 0 THEN ARGAP = 0
     IF DEPTIM > LUNSTIM AND PDEPT < LUNFTIM THEN
                          FRCTIM = LUNSTIM - PDEPT - LUNFTIM + CALTIM: GOTO 1140
     FRCTIM = CALTIM - PDEPT
1140 SERTIM = DEPTIM - CALTIM
     IF FRCTIM < 0 THEN FRCTIM = 0
     WATIM = DEPTIM - ARTIM
     WRITE #1, CUSTNO, ARTIM, CALTIM, DEPTIM, CNT, DT$, DAY
     WRITE #2, CUSTNO, WATIM, SERTIM, ARGAP, FRCTIM, CNT, DT$, DAY
     WRITE #9, CUSTNO, A21, A22, A23, CNT, DT$, DAY
     CTOTAL = CTOTAL + 1
     TM% = (ARGAP / 60): IF TM% > 45 THEN TM% = 45
     IF TM% = 0 THEN TM% = 1
     IF TM% > TTMM THEN TTMM = TM%
     TONOARGP(TM%, CNT, DAY) = TONOARGP(TM%, CNT, DAY) + 1
     MT% = (SERTIM / 60)
     IF MT% > MMTT THEN MMTT = MT%
     IF MT% = 0 THEN MT% = 1
     TOTNOSER(MT%, CNT, DAY) = TOTNOSER(MT%, CNT, DAY) + 1
     TOTWATM(CNT) = TOTWATM(CNT) + WATIM
     TOTSER(CNT) = TOTSER(CNT) + SERTIM
     TOTARGP(CNT) = TOTARGP(CNT) + ARGAP
     IF FRCTIM > 0 THEN TOTFCTM(CNT) = TOTFCTM(CNT) + FRCTIM
     IF A11 <> 0 THEN L = FIX(A21) - FIX(A11) + 1
     IF A11 = 0 THEN L = FIX(A21) - FIX(A13) + 1
     TTTOT(L, CNT) = TTTOT(L, CNT) + 1
     TOTA(L) = TOTA(L) + 1
     IF DAY = 1 THEN TOTAL1 = TOTAL1 + 1: TOTL(1, CNT) = TOTL(1, CNT) + 1
                                        : TOT(1, L) = TOT(1, L) + 1
     IF DAY = 2 THEN TOTAL2 = TOTAL2 + 1: TOTL(2, CNT) = TOTL(2, CNT) + 1
                                        : TOT(2, L) = TOT(2, L) + 1
     IF DAY = 3 THEN TOTAL3 = TOTAL3 + 1: TOTL(3, CNT) = TOTL(3, CNT) + 1
                                        : TOT(3, L) = TOT(3, L) + 1
     IF DAY = 4 THEN TOTAL4 = TOTAL4 + 1: TOTL(4, CNT) = TOTL(4, CNT) + 1
                                        : TOT(4, L) = TOT(4, L) + 1
     IF DAY = 5 THEN TOTAL5 = TOTAL5 + 1: TOTL(5, CNT) = TOTL(5, CNT) + 1
                                        : TOT(5, L) = TOT(5, L) + 1
     IF DAY = 6 THEN TOTAL6 = TOTAL6 + 1: TOTL(6, CNT) = TOTL(6, CNT) + 1
                                        : TOT(6, L) = TOT(6, L) + 1
     IF DAY = 7 THEN TOTAL7 = TOTAL7 + 1: TOTL(7, CNT) = TOTL(7, CNT) + 1
                                        : TOT(7, L) = TOT(7, L) + 1
```

```
1139 PTIM = ARTIM
     PDEPT = DEPTIM
     IF DEPTIM >= ISCCTIM THEN 1260
1160 CLS : X = 8: Y = 5: Z = 8: W = 70: GOSUB 6000
     LOCATE 11, 10: PRINT "IS THERE ANY MORE DATA COLLECTED FOR "; DT$;
'                                                    " FOR COUNT NO. "; CNT
     LOCATE 13, 15: PRINT "          PRESS Y FOR YES AND N FOR NO."
1170 X$ = "": X$ = INKEY$
     IF X$ = "Y" OR X$ = "y" THEN 1120
     IF X$ = "N" OR X$ = "n" THEN 1260
     GOTO 1170
1260 TRT = ISCCTIM - DEPTIM
     IF TRT > 0 THEN TOTFCTM(CNT) = TOTFCTM(CNT) + TRT
     CNT = CNT + 1: IF CNT <= NOCOUNT THEN 1080
1265 CLS : X = 9: Y = 5: Z = 6: W = 70: GOSUB 6000
     GOSUB 5900
     LOCATE 11, 14: PRINT "IS THERE ANY DATA COLLECTED FOR "; DT$
     LOCATE 13, 9: PRINT "PRESS Y FOR YES AND N FOR NO.& C IF SAMPLE DATA ENTRY"
'                                                          COMPLETED "
1270 X$ = "": X$ = INKEY$
     IF X$ = "Y" OR X$ = "y" THEN CNT = 1: DAY = DAY + 1: GOTO 1080
     IF X$ = "N" OR X$ = "n" THEN GOTO 1265
     IF X$ = "C" OR X$ = "c" THEN 1300
     GOTO 1270
1300 CLOSE : GOSUB 19100
'    ************************************************************************
'    *    SAMARGAP.FIL  CONTAINS INFORMATION OF NO OF PEOPLE                *
'    *    ARRIVED AT DIFF INTERVAL OF TIME                                  *
'    *    SAMSER.FIL  CONTAINS INFORMATION OF NO OF PEOPLE                  *
'    *    SERVICED AT DIFF INTERVAL OF TIME                                 *
'    *    SAMTDAT.FIL  CONTAINS INFORMATION  OF TOTAL OF                    *
'    *    WATING TIME,SERVICE TIME,ARR. GAP AND TOT IDLE                    *
'    *    TIME OF EACH COUNTER                                              *
'    ************************************************************************
     OPEN "SAMARGAP.FIL" FOR OUTPUT AS #1
     OPEN "SAMSER.FIL" FOR OUTPUT AS #2
     OPEN "SAMTDAT.FIL" FOR OUTPUT AS #3
     FOR C = 1 TO NOCOUNT
     FOR D = 1 TO NOWDYS
     FOR N = 1 TO TTMM
     WRITE #1, TTMM, TONOARGP(N, C, D)
     NEXT N
     FOR L = 1 TO MMTT
     WRITE #2, MMTT, TOTNOSER(L, C, D)
     NEXT L
     NEXT D
     WRITE #3, TOTWATM(C), TOTSER(C), TOTARGP(C), TOTFCTM(C)
     NEXT C
     CLOSE
     OPEN "MASTFIL.FIL" FOR INPUT AS #9
     INPUT #9, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS,
'                                                          NOWDYS, TYPE$
     IF A12 = 0 THEN K = FIX(A14) - FIX(A13) + 1: S = FIX(A13): GOTO 1305
     K = FIX(A14) - FIX(A11) + 1: S = FIX(A11)
1305 OPEN "SAMPNO1.FIL" FOR OUTPUT AS #1
```

```
'     ***************************************************************************
'     *                        SAMPLE DATA FILES                                *
'     *                     *********************                               *
'     *                                                                         *
'     *  SAMPNO1.FIL CONTAINS TOT.NO OF ARR./DAY OF THE WEEK FOR ALL WEEKS      *
'     *  FOR ALL COUNTERS TOGETHER                                              *
'     *                                                                         *
'     *  SAMPNO2.FIL CONTAINS TOT.NO OF ARR./DAY OF THE WEEK FOR ALL WEEKS      *
'     *  FOR INDIVIDUAL COUNTERS                                                *
'     *                                                                         *
'     *  SAMPNO3.FIL CONTAINS TOT.NO OF ARR./HOURS/DAY OF THE WEEK              *
'     *  OR ALL WEEKS FOR INDIVIDUAL COUNTERS                                   *
'     *                                                                         *
'     *  SAMPNO4.FIL CONTAINS TOT.NO OF ARR./HOURS OF THE DAY FOR ALL WEEKS     *
'     *  FOR ALL COUNTERS TOGETHER                                              *
'     *  SAMPNO5.FIL CONTAINS TOT.NO OF ARR./HOURS OF THE DAY OF THE WEEK       *
'     *  FOR ALL THE WEEKS OF ALL THE COUNTERS  TOGETHER                        *
'     *                                                                         *
'     ***************************************************************************

      WRITE #1, CTOTAL, TOTAL1, TOTAL2, TOTAL3, TOTAL4, TOTAL5, TOTAL6, TOTAL7
      OPEN "SAMPNO2.FIL" FOR OUTPUT AS #2
      FOR C = 1 TO NOCOUNT
      WRITE #2, TOTL(1, C), TOTL(2, C), TOTL(3, C), TOTL(4, C), TOTL(5, C),
'                                                   TOTL(6, C), TOTL(7, C)
      NEXT C
      OPEN "SAMPNO3.FIL" FOR OUTPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR L = 1 TO K
      WRITE #3, TTTOT(L, C)
      NEXT L
      NEXT C
      OPEN "SAMPNO4.FIL" FOR OUTPUT AS #4
      OPEN "SAMPNO5.FIL" FOR OUTPUT AS #5
      FOR T = 1 TO K
      WRITE #5, TOT(1, T), TOT(2, T), TOT(3, T), TOT(4, T), TOT(5, T),
'                                                TOT(6, T), TOT(7, T)
      WRITE #4, TOTA(T)
      NEXT T
      CLOSE : GOTO 40
3000  REM SIMULATION SUBROUTINE*************************************************
      GOSUB 4600: REM INITIALISATION OF VARIABLES*******************************
      CLS : X = 9: Y = 9: Z = 6: W = 67: GOSUB 6000
      LOCATE 7, 24: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
      LOCATE 11, 11
      PRINT "WHICH DAY OF THE WEEK SIMULATION TO START(ALPHABETIC):"
      LOCATE 11, 65: INPUT WKDAY$: WKDAY$ = LEFT$(WKDAY$, 3) + "DAY": GOSUB 4100
      IF FLGT$ = "F" THEN 3000
      LOCATE 11, 65: PRINT " "; WKDAY$; "  "
      LOCATE 13, 11: INPUT "FOR HOW MANY WEEKS TO BE SIMULATED:"; NOWKS
      LOCATE 16, 17: PRINT "PRESS Y IF YES, N IF NOT AND X TO EXIT TO MAIN MENU"
3010   X$ = "": X$ = INKEY$
      IF X$ = "Y" OR X$ = "y" THEN 3020
      IF X$ = "N" OR X$ = "n" THEN 3000
      IF X$ = "X" OR X$ = "x" THEN 41
      GOTO 3010
```

```
3020 CLS : LOCATE 7, 34: PRINT " SIMULATION  PROGAM"
     LOCATE 8, 31: PRINT "************************"
     X = 10: Y = 10: Z = 5: W = 65: GOSUB 6000
     LOCATE 12, 14: INPUT "ENTER SIMULATION STARTING DATE :"; DT$
     GOSUB 17000: LOCATE 12, 46
     IF FLAG$ = "F" THEN 3025
     GOTO 3030
3025 PRINT "            ": LOCATE 23, 5
     PRINT "ENTER DATE IN (dd / mm / yy) PLEASE ": GOTO 3020
3030 PRINT DT$; "  ": FOR J = 1 TO 10: NEXT J
     OPEN "MASTDAT.FIL" FOR INPUT AS #3
     OPEN "MASTFIL.FIL" FOR INPUT AS #4
     OPEN "SMASTFIL.FIL" FOR OUTPUT AS #5
     INPUT #3, TCSTIM, TCCTIM, ISCSTIM, ISCCTIM, LUNSTIM, LUNFTIM, NOCOUNT
'                                        , SWKDAY$, SDIFF, SNOWKS, NOWDYS, TYPE$
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, SWKDAY$, SDIFF, SNOWKS
'                                                    , NOWDYS, TYPE$
     WRITE #5, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWK
'                                                  , NOWDYS, TYPE$
     CLOSE #3, #4, #5
     GOSUB 5400
     GOSUB 4050
     DAY = 1
     D = DAY + SDIFF - DIFF
     CLS : X = 8: Y = 5: Z = 9: W = 70: GOSUB 6000
     LOCATE 5, 23: PRINT "SIMULATION OF QUEUING SYSTEM DATA ENTRY"
     LOCATE 6, 20: PRINT "*********************************************"
     LOCATE 7, 60: PRINT "DATA OF "
     LOCATE 10, 12: PRINT "CUST.NO.:"
     LOCATE 10, 60: PRINT "COUNTER NO"
     LOCATE 12, 12: PRINT "ARRTIME OF CUST.:"
     LOCATE 14, 12: PRINT "CALL TIME OF CUST.:";
     LOCATE 16, 12: PRINT "DEPARTURE TIME OF CUST.:"
3080 K = 0: IF DAY > NOWDYS THEN DAY = 1
     IF D > NOWDYS OR D < 0 THEN D = 1
     FOR C = 1 TO NOCOUNT
     SCUSTNO(C) = 0
     SPDEPT(C) = ISCSTIM
     IF TCSTIM > 0 THEN SPTIM(C) = TCSTIM
     IF TCSTIM <= 0 THEN SPTIM(C) = ISCSTIM
     GL1%(C) = 0
     AB(C) = 0
     NEXT C
3120 IF TYPE$ = "Y" OR TYPE$ = "y" THEN GOSUB 3900: GOTO 3121

'              ************************************************
'              *     FOR OTHER TYPE OF QUE THE LOGIC IN       *
'              *     THIS SECTION IS TO BE MODIFIED .         *
'              ************************************************

     GOSUB 5550: REM GENERATION OF RANDOM NO. FOR COUNTER SELECTION ***********
     GOSUB 5800: REM CALCULATION OF SERVICE COUNTER W.R.T. RANDOM NO.**********
     IF GL1%(CNT) = 1 THEN 3120
3121 GOSUB 5500: REM GENERATION OF RANDOM NO. FOR ARR.GAP *********************

     GOSUB 5600: REM CALCULATION OF ARR.GAP W.R.T. RANDOM NO.******************

     GOSUB 5500: REM GENERATION OF RANDOM NO. FOR SERVICE TIME ****************

     GOSUB 5700: REM CALCULATION OF SERVICE TIME W.R.T.RANDOM NO.**************
```

```
     SCUSTNO(CNT) = SCUSTNO(CNT) + 1
3122 ARTIM = SPTIM(CNT) + SARGAP
     IF ARTIM > ISCCTIM THEN 3260
     IF (ARTIM >= LUNSTIM) AND ARTIM < LUNFTIM THEN SPTIM(CNT) = LUNFTIM:
                                                          GOTO 3122
     IF SPDEPT(CNT) >= ARTIM THEN CALTIM = SPDEPT(CNT)
     IF SPDEPT(CNT) < ARTIM THEN CALTIM = ARTIM
     IF (CALTIM >= LUNSTIM) AND CALTIM < LUNFTIM THEN CALTIM = LUNFTIM
     DEPTIM = CALTIM + SSERTIM
     IF DEPTIM > ISCCTIM OR CALTIM > ISCCTIM THEN 3260
3130 LOCATE 7, 68: PRINT DT$
     LOCATE 10, 21: PRINT SCUSTNO(CNT)
     LOCATE 10, 70: PRINT CNT
3131 CONVTIM = ARTIM: GOSUB 13000: IF FLAG$ = "F" THEN 3131
     LOCATE 12, 29: PRINT USING "##.####"; CONVTIM; : PRINT "  ": A21 = CONVTIM
3132 CONVTIM = CALTIM: GOSUB 13000: IF FLAG$ = "F" THEN 3132
     LOCATE 14, 31: PRINT USING "##.####"; CONVTIM; : PRINT "  ": A22 = CONVTIM
3133 CONVTIM = DEPTIM
     GOSUB 13000: IF FLAG$ = "F" THEN 3133
     LOCATE 16, 37: PRINT USING "##.####"; CONVTIM; : PRINT "  ": A23 = CONVTIM
     ARGAP = SARGAP
     LTTE = 0
     IF (DEPTIM > LUNSTIM) AND SPDEPT(CNT) < LUNFTIM THEN
                    FRCTIM = LUNSTIM - SPDEPT(CNT) - LUNFTIM + CALTIM: GOTO 3134
     FRCTIM = CALTIM - SPDEPT(CNT)
3134 SERTIM = SSERTIM
     IF FRCTIM < 0 THEN FRCTIM = 0
     WATIM = DEPTIM - ARTIM
     WRITE #1, SCUSTNO(CNT), ARTIM, CALTIM, DEPTIM, CNT, DT$, DAY
     WRITE #2, SCUSTNO(CNT), WATIM, SERTIM, ARGAP, FRCTIM, CNT, DT$, DAY
     WRITE #9, SCUSTNO(CNT), A21, A22, A23, CNT, DT$, DAY
     CTOTAL = CTOTAL + 1
     IF A11 <> 0 THEN L = FIX(A21) - FIX(A11) + 1
     IF A11 = 0 THEN L = FIX(A21) - FIX(A13) + 1
     TTTOT(L, CNT) = TTTOT(L, CNT) + 1
     TOTA(L) = TOTA(L) + 1
     IF DAY = 1 THEN TOTAL1 = TOTAL1 + 1: TOTL(1, CNT) = TOTL(1, CNT) + 1
     : TOT(1, L) = TOT(1, L) + 1
     IF DAY = 2 THEN TOTAL2 = TOTAL2 + 1: TOTL(2, CNT) = TOTL(2, CNT) + 1
     : TOT(2, L) = TOT(2, L) + 1
     IF DAY = 3 THEN TOTAL3 = TOTAL3 + 1: TOTL(3, CNT) = TOTL(3, CNT) + 1
     : TOT(3, L) = TOT(3, L) + 1
     IF DAY = 4 THEN TOTAL4 = TOTAL4 + 1: TOTL(4, CNT) = TOTL(4, CNT) + 1
     : TOT(4, L) = TOT(4, L) + 1
     IF DAY = 5 THEN TOTAL5 = TOTAL5 + 1: TOTL(5, CNT) = TOTL(5, CNT) + 1
     : TOT(5, L) = TOT(5, L) + 1
     IF DAY = 6 THEN TOTAL6 = TOTAL6 + 1: TOTL(6, CNT) = TOTL(6, CNT) + 1
     : TOT(6, L) = TOT(6, L) + 1
     IF DAY = 7 THEN TOTAL7 = TOTAL7 + 1: TOTL(7, CNT) = TOTL(7, CNT) + 1
     : TOT(7, L) = TOT(7, L) + 1
     TM% = (ARGAP / 60): IF TM% > 45 THEN TM% = 45
     IF TM% = 0 THEN TM% = 1
     IF TM% > TTMM THEN TTMM = TM%
     TONOARGP(TM%, CNT, DAY) = TONOARGP(TM%, CNT, DAY) + 1
     MT% = (SERTIM / 60)
     IF MT% = 0 THEN MT% = 1
     IF MT% > MMTT THEN MMTT = MT%
     TOTNOSER(MT%, CNT, DAY) = TOTNOSER(MT%, CNT, DAY) + 1
     TOTWATM(CNT) = TOTWATM(CNT) + WATIM
     TOTSER(CNT) = TOTSER(CNT) + SERTIM
     TOTARGP(CNT) = TOTARGP(CNT) + ARGAP
```

```
      IF FRCTIM > 0 THEN TOTFCTM(CNT) = TOTFCTM(CNT) + FRCTIM
3139  SPTIM(CNT) = ARTIM
      IF TCCTIM > 0 AND ARTIM > TCCTIM AND AB(CNT) = 0 THEN
                              SPTIM(CNT) = DEPTIM: AB(CNT) = 1
      SPDEPT(CNT) = DEPTIM
      GOTO 3120
3260
'                 ************************************************
'                 *      FOR OTHER TYPE OF QUE THE LOGIC IN      *
'                 *      THIS SECTION IS TO BE MODIFIED .        *
'                 ************************************************

      TRT = ISCCTIM - DEPTIM
      IF TRT > 0 THEN TOTFCTM(CNT) = TOTFCTM(CNT) + TRT
      GL1%(CNT) = 1
      FLAG$ = "T"
      FOR C = 1 TO NOCOUNT
      IF GL1%(C) = 0 THEN FLAG$ = "F"
      NEXT C
      IF FLAG$ = "F" THEN 3120
      DAY = DAY + 1
      D = D + 1
      IF DAY > NOWDYS THEN TOTNOWKS = TOTNOWKS + 1
      IF TOTNOWKS = NOWKS AND DAY > NOWDYS THEN 3300
      GOSUB 5900
      GOTO 3080
3300  CLOSE : GOSUB 19100
      OPEN "SIMARGAP.FIL" FOR OUTPUT AS #1
      OPEN "SIMSER.FIL" FOR OUTPUT AS #2
      OPEN "SIMTDAT.FIL" FOR OUTPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR D = 1 TO NOWDYS
      FOR N = 1 TO TTMM
      WRITE #1, TTMM, TONOARGP(N, C, D)
      NEXT N
      FOR L = 1 TO MMTT
      WRITE #2, MMTT, TOTNOSER(L, C, D)
      NEXT L
      NEXT D
      WRITE #3, TOTWATM(C), TOTSER(C), TOTARGP(C), TOTFCTM(C)
      NEXT C
      CLOSE
      OPEN "MASTFIL.FIL" FOR INPUT AS #9
      INPUT #9, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS
'                                                          , NOWDYS, TYPE$
      IF A12 = 0 THEN K = FIX(A14) - FIX(A13) + 1: S = FIX(A13): GOTO 3305
      K = FIX(A14) - FIX(A11) + 1: S = FIX(A11)
3305  OPEN "SIMUNO1.FIL" FOR OUTPUT AS #1
      WRITE #1, CTOTAL, TOTAL1, TOTAL2, TOTAL3, TOTAL4, TOTAL5, TOTAL6, TOTAL7
      OPEN "SIMUNO2.FIL" FOR OUTPUT AS #2
      FOR C = 1 TO NOCOUNT
      WRITE #2, TOTL(1, C), TOTL(2, C), TOTL(3, C), TOTL(4, C), TOTL(5, C)
'                                                  , TOTL(6, C), TOTL(7, C)
      NEXT C
      OPEN "SIMUNO3.FIL" FOR OUTPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR L = 1 TO K
      WRITE #3, TTTOT(L, C)
      NEXT L
      NEXT C
      OPEN "SIMUNO4.FIL" FOR OUTPUT AS #4
      OPEN "SIMUNO5.FIL" FOR OUTPUT AS #5
```

```
    FOR T = 1 TO K
    WRITE #5, TOT(1, T), TOT(2, T), TOT(3, T), TOT(4, T), TOT(5, T)
                                              , TOT(6, T), TOT(7, T)
    WRITE #4, TOTA(T)
    NEXT T
    CLOSE : GOTO 40
3900 REM SELECTION OF COUNTER FOR SAME TYPE OF OPERATION************************
     SMALEST = 9000
     FOR C = 1 TO NOCOUNT
     IF SMALEST < SCUSTNO(C) THEN CNT = C
     NEXT C
     RETURN
4000 REM SUBROUTINE  FOR OPENING SAMPLE MASTER FILES ***************************
    OPEN "SAMPDAT.FIL" FOR APPEND AS #1
    OPEN "COMPUT.FIL" FOR APPEND AS #2
    OPEN "TABLEDAT.FIL" FOR APPEND AS #9
    RETURN
4050 REM SUBROUTINE  FOR OPENING SIMULATION MASTER FILES ***********************
    OPEN "SIMUDAT.FIL" FOR OUTPUT AS #1
    OPEN "SIMCOMP.FIL" FOR OUTPUT AS #2
    OPEN "SIMTABLE.FIL" FOR OUTPUT AS #9
    RETURN
4100 REM CALCULATION OF DIFF IN STARTING DAY FROM MONDAY ************************
    FLGT$ = "T"
    IF DAY = 1 THEN WD$ = WKDAY$
    IF WKDAY$ = "MON-DAY" THEN J = 1: DIFF = J - 1: RETURN
    IF WKDAY$ = "TUE-DAY" THEN J = 2: DIFF = J - 1: RETURN
    IF WKDAY$ = "WED-DAY" THEN J = 3: DIFF = J - 1: RETURN
    IF WKDAY$ = "THU-DAY" THEN J = 4: DIFF = J - 1: RETURN
    IF WKDAY$ = "FRI-DAY" THEN J = 5: DIFF = J - 1: RETURN
    IF WKDAY$ = "SAT-DAY" THEN J = 6: DIFF = J - 1: RETURN
    IF WKDAY$ = "SUN-DAY" THEN J = 7: DIFF = J - 1: RETURN
    FLGT$ = "F": RETURN
4500 J = DAY + DIFF: IF J > 7 THEN J = J - 7
    IF J = 1 THEN WD$ = "MON-DAY"
    IF J = 2 THEN WD$ = "TUE-DAY"
    IF J = 3 THEN WD$ = "WED-DAY"
    IF J = 4 THEN WD$ = "THU-DAY"
    IF J = 5 THEN WD$ = "FRI-DAY"
    IF J = 6 THEN WD$ = "SAT-DAY"
    IF J = 7 THEN WD$ = "SUN-DAY"
    RETURN
4600 REM INITIALISATION OF SUBSCRIPT VARIABLES**********************************
    GOSUB 19100
    FOR I = 1 TO 20
    GL1%(I) = 0
    FOR J = 1 TO NOCOUNT
    TTTOT(I, J) = 0
    FOR D = 1 TO NOWDYS
    TOT(D, I) = 0
    TOTNOSER(I, J, D) = 0
    NEXT D
    TOTL(I, J) = 0: TOTWATM(J) = 0: TOTSER(J) = 0
    TOTARGP(J) = 0: TOTFCTM(J) = 0
    NEXT J
    TOTA(I) = 0
    NEXT I
    FOR H = 1 TO 45
    FOR J = 1 TO NOCOUNT
    FOR D = 1 TO NOWDYS
    TONOARGP(H, J, D) = 0
    NEXT D
    NEXT J
    NEXT H
    RETURN
```

```
4700 REM QUEUE LENGHT*************************************************************
     CLS : X = 7: Y = 14: Z = 10: W = 56: GOSUB 6000
     LOCATE 4, 24: PRINT "       LENGHT MENU"
     LOCATE 5, 22: PRINT "************************"
     LOCATE 9, 17: PRINT "1].  SAMPLE DATA"
     LOCATE 12, 17: PRINT "2].  SIMULATED DATA"
     LOCATE 15, 17: PRINT "3].  EXIT TO THE MAIN MENU"
     LOCATE 22, 15: PRINT "SELECT 1...3 FROM MENU RELATING TO YOUR CHOICE"
4705 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN FIL$ = "TABLEDAT.FIL": FIL2$ = "MASTFIL.FIL"
                                           : ABB$ = "SAMPLE DATA": GOTO 4710
     IF X$ = "2" THEN FIL$ = "SIMTABLE.FIL": FIL2$ = "SMASTFIL.FIL"
                                           : ABB$ = "SIMULATED DATA": GOTO 4710
     IF X$ = "3" THEN 41
     GOTO 4705
4710 GOSUB 19100
     OPEN FIL2$ FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS
                                                          , NOWDYS, TYPE$
     CLOSE #4
     X = 0: NOSTEP = 0
     FOR J = 1 TO NOCOUNT
     TOTARGP(J) = 0
     LNG(J) = 0
     NEXT J
     IF A11 > 0 THEN TIM = A11
     IF A11 = 0 THEN TIM = A13
     TIM = TIM + .3: X = 0
     IF TIM - FIX(TIM) > .5 THEN TIM = FIX(TIM) + 1
4740 OPEN FIL$ FOR INPUT AS #1
     WHILE NOT EOF(1)
     INPUT #1, CUSTNO, A21, A22, A23, CNT, DT$, DAY
     CON = 0
     FOR MNT = TIM TO A14 STEP .3
     CON = CON + 1
     IF MNT > A15 AND MNT < A16 THEN MNT = A16
     IF MNT - FIX(MNT) > .5 THEN MNT = FIX(MNT) + 1
     IF (MNT >= A21) AND MNT < A23 THEN 4732
     IF MNT >= A23 THEN MNT = A14
     GOTO 4730
4732 IF CUSTNO = 1 AND DAY = 2 THEN X = 0
     IF CUSTNO = 1 AND DAY = 1 AND X = 0 THEN GOSUB 4790: X = 1
     TONOARGP(CON, CNT, DAY) = TONOARGP(CON, CNT, DAY) + 1
     TOTARGP(CNT) = TOTARGP(CNT) + 1
     IF LNG(CNT) < TONOARGP(CON, CNT, DAY) THEN
                                           LNG(CNT) = TONOARGP(CON, CNT, DAY)
4730 NEXT MNT
     WEND
4735 CLOSE
     NOSTEP = NOWKS * (A14 - TIM) * 2
     GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
     GOSUB 19100
     LPRINT TAB(35); "QUEUE LENGHT "; ABB$
     LPRINT TAB(32); "*********************************"
     LPRINT : LPRINT
     FOR C = 1 TO NOCOUNT
     LPRINT TAB(15); "LONGEST QUEUE LENGHT OF COUNTER NO."; C; " = ";
     LPRINT USING "#######"; LNG(C)
     LPRINT
     LPRINT TAB(15); "AVERAGE QUEUE LENGHT OF COUNTER NO."; C; " = ";
     LPRINT USING "#######"; TOTARGP(C) / (NOSTEP * NOWDYS)
     LPRINT : LPRINT
     NEXT C
     GOTO 40
```

```
4790 REM INITIALISATION OF VARIABLE FOR QUEUE LENGHT ************************
     FOR J = 1 TO NOCOUNT
     FOR D = 1 TO NOWDYS
     FOR H = 1 TO 45
     TONOARGP(H, J, D) = 0
     NEXT H
     NEXT D
     NEXT J
     RETURN
5000
'              ************************************************
'              *      SUB FOR CALCULATION AND LISTING OF      *
'              *      AR.GAP,SERVICE,COUNTER'S LIMITS         *
'              ************************************************
     CLOSE
     OPEN "MASTFIL.FIL" FOR INPUT AS #9
     INPUT #9, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, SNOWKS
'                                                              , NOWDYS, TYPE$
     CLOSE
     GOSUB 19100
     FOR J = 1 TO 5
     FOR D = 1 TO NOWDYS
     FOR I = 1 TO 35
     LMTS(I, J, D) = 0
     NEXT I
     FOR T = 1 TO 45
     LMTG(T, J, D) = 0:
     NEXT T
     LMTC(J, D) = 0
     TT3%(J, D) = 0
     TT4%(J, D) = 0
     TOT(J, D) = 0
     NEXT D
     NEXT J
     OPEN "SAMARGAP.FIL" FOR INPUT AS #1
     OPEN "SAMSER.FIL" FOR INPUT AS #2
     INPUT #1, TTMM, TT1
     INPUT #2, MMTT, TT2
     CLOSE
     OPEN "SAMARGAP.FIL" FOR INPUT AS #1
     FOR C = 1 TO NOCOUNT
     FOR D = 1 TO NOWDYS
     FOR N = 1 TO TTMM
     INPUT #1, TTMM, TT1
     TOT(C, D) = TOT(C, D) + TT1
     IF TT1 > 0 THEN TT3%(C, D) = TT3%(C, D) + TT1 / (SNOWKS)
     NEXT N
     NEXT D
     NEXT C
     OPEN "SAMSER.FIL" FOR INPUT AS #2
     FOR C = 1 TO NOCOUNT
     FOR D = 1 TO NOWDYS
     FOR N = 1 TO MMTT
     INPUT #2, MMTT, TT2
     IF TT2 > 0 THEN TT4%(C, D) = TT4%(C, D) + TT2 / (SNOWKS)
     LMTG(N, C, D) = 0
     LMTS(N, C, D) = 0
     NEXT N
     LMTC(C, D) = 0
     NEXT D
     NEXT C
     CLOSE #1, #2
```

```
      OPEN "SAMARGAP.FIL" FOR INPUT AS #1
      OPEN "SAMSER.FIL" FOR INPUT AS #2
      FOR C = 1 TO NOCOUNT
      FOR DAY = 1 TO NOWDYS
      GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
      IF X$ = "S" OR X$ = "s" THEN FOR N = 1 TO TTMM: INPUT #1, TTMM, X
      NEXT N: GOTO 5112
      LPRINT TAB(23); "SIMULATION OF QUEUING SYSTEM"
      LPRINT TAB(10); "CALCULATION OF LIMITS FOR ARR.GAP TIME FOR";
      LPRINT " GENERATION OF RANDOM NO."
      LPRINT TAB(32); "FOR COUNTER NO.:"; C;
      LPRINT " FOR "; : GOSUB 4500: LPRINT WD$
      LPRINT TAB(6); STRING$(68, "_")
      LPRINT TAB(6); "¦ "; "TOT.NO.OF"; TAB(18); "¦ "; "ARR.GAP"; TAB(28); "¦ ";
      LPRINT "AV.NO.OF"; TAB(38); "¦ "; "CUMULATIVE"; TAB(50); "¦"; " PROB. ";
      LPRINT TAB(58); "¦ "; "   RAND.NO."; TAB(74); "¦ "
      LPRINT TAB(6); "¦ "; "ARRIVALS "; TAB(18); "¦ "; " TIME  "; TAB(28); "¦ ";
      LPRINT "ARR./DAY"; TAB(38); "¦ "; " ARRIVALS "; TAB(50); "¦"; "OF ARR.";
      LPRINT TAB(58); "¦ "; "    LIMIT  "; TAB(74); "¦ "
      LPRINT TAB(6); STRING$(68, "_")
      Y = 0: PRV = 0
      FOR N = 1 TO TTMM
      IND% = 0: TTTR% = 0
      INPUT #1, TTMM, X
      IF X = 0 THEN 5111
      LPRINT TAB(6); "¦ "; : LPRINT USING "######"; X;
      LPRINT TAB(18); "¦ "; : LPRINT USING "###"; N; : LPRINT " MIN.";
      LPRINT TAB(28); "¦ ";
      IF X > 0 THEN IND% = X / (SNOWKS)
      IF X > 0 THEN LPRINT USING "####"; IND%;
      Y = Y + IND%
      LPRINT TAB(38); "¦ ";
      IF Y > 0 THEN LPRINT USING "######"; Y;
      LPRINT TAB(50); "¦ ";
      IF Y > 0 THEN LPRINT USING "#.###"; (Y / TT3%(C, DAY));
      IF Y > 0 THEN TTTR% = ((Y / TT3%(C, DAY)) * 1000)
      IF Y > 0 THEN LMTG(N, C, DAY) = TTTR%
      LPRINT TAB(58); "¦  ";
      IF N = 1 AND LMTG(N, C, DAY) = 0 THEN 5100
      IF N > 1 THEN IF (LMTG((N - 1), C, DAY)) = LMTG(N, C, DAY) THEN 5100
      IF PRV = 0 THEN LPRINT "  0";
      IF PRV > 0 THEN LPRINT USING "###"; PRV + 1;
      IF N < TTMM THEN LPRINT " - "; : LPRINT USING "####"; LMTG(N, C, DAY);
      IF N = TTMM THEN LPRINT " - "; : LPRINT USING "####"; LMTG(N, C, DAY);
      PRV = LMTG(N, C, DAY)
5100  LPRINT TAB(74); "¦"
5111  NEXT N
      LPRINT TAB(6); STRING$(68, "_")
5112  NEXT DAY
      NEXT C
      FOR C = 1 TO NOCOUNT
      FOR DAY = 1 TO NOWDYS
      GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
      IF X$ = "S" OR X$ = "s" THEN FOR L = 1 TO MMTT: INPUT #1, MMTT, X
      NEXT L: GOTO 5113
      LPRINT TAB(25); "SIMULATION OF QUEUING SYSTEM"
      LPRINT TAB(10); "CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION";
      LPRINT " OF RANDOM NO."
      LPRINT TAB(32); "FOR COUNTER NO.:"; C;
      LPRINT " FOR "; : GOSUB 4500: LPRINT WD$
      LPRINT TAB(6); STRING$(68, "_")
```

```
      LPRINT TAB(6); "¦ "; "TOT.NO.OF"; TAB(18); "¦ "; "SERVICE"; TAB(28); "¦ ";
      LPRINT "AV.NO.OF"; TAB(38); "¦ "; "CUMULATIVE"; TAB(50); "¦"; " PROB. ";
      LPRINT TAB(58); "¦ "; "   RAND.NO."; TAB(74); "¦ "
      LPRINT TAB(6); "¦ "; "ARRIVALS "; TAB(18); "¦ "; " TIME   ";
      LPRINT TAB(28); "¦ "; "ARR./DAY"; TAB(38); "¦ "; " ARRIVALS "; TAB(50);
      LPRINT "¦"; "OF ARR."; TAB(58); "¦ "; "    LIMIT  "; TAB(74); "¦ "
      LPRINT TAB(6); STRING$(68, "_")
      Y = 0: PRV = 0
      FOR L = 1 TO MMTT
      IND% = 0: TTTR% = 0
      INPUT #2, MMTT, X
      IF X = 0 THEN 5201
      LPRINT TAB(6); "¦ "; : LPRINT USING "#####"; X;
      LPRINT TAB(18); "¦ "; : LPRINT USING "###"; L;
      LPRINT " MIN."; : LPRINT TAB(28); "¦ ";
      IF X > 0 THEN IND% = X / (SNOWKS)
      IF X > 0 THEN LPRINT USING "####"; IND%;
      Y = Y + IND%
      LPRINT TAB(38); "¦ ";
      IF Y > 0 THEN LPRINT USING "#####"; Y;
      LPRINT TAB(50); "¦ ";
      IF Y > 0 THEN LPRINT USING "#.###"; (Y / TT4%(C, DAY));
      IF Y > 0 THEN TTTR% = ((Y / TT4%(C, DAY)) * 1000)
      IF Y > 0 THEN LMTS(L, C, DAY) = TTTR%
      LPRINT TAB(58); "¦  ";
      IF L = 1 AND LMTS(L, C, DAY) = 0 THEN 5200
      IF L > 1 THEN IF (LMTS((L - 1), C, DAY)) = LMTS(L, C, DAY) THEN 5200
      IF PRV = 0 THEN LPRINT "  0";
      IF PRV > 0 THEN LPRINT USING "###"; PRV + 1;
      IF L < MMTT THEN LPRINT " - "; : LPRINT USING "####"; LMTS(L, C, DAY);
      IF L = MMTT THEN LPRINT " - "; : LPRINT USING "####"; LMTS(L, C, DAY);
      PRV = LMTS(L, C, DAY)
5200  LPRINT TAB(74); "¦"
5201  NEXT L
      LPRINT TAB(6); STRING$(68, "_")
5113  NEXT DAY
      NEXT C
      CLOSE
      FOR DAY = 1 TO NOWDYS
      GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
      IF X$ = "S" OR X$ = "s" THEN 5114
      LPRINT TAB(25); "SIMULATION OF QUEUING SYSTEM"
      LPRINT TAB(10); "CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION";
      LPRINT " OF RANDOM NO."
      GOSUB 4500: LPRINT TAB(25); " FOR "; WD$
      LPRINT TAB(6); STRING$(68, "_")
      LPRINT TAB(6); "¦ "; "TOT.NO.OF"; TAB(18); "¦ "; "SERVICE"; TAB(28); "¦ ";
      LPRINT "AV.NO.OF"; TAB(38); "¦ "; "CUMULATIVE"; TAB(50); "¦"; " PROB. ";
      LPRINT TAB(58); "¦ "; "   RAND.NO."; TAB(74); "¦ "
      LPRINT TAB(6); "¦ "; "ARRIVALS "; TAB(18); "¦ "; " COUNTER";
      LPRINT TAB(28); "¦ "; "ARR./DAY"; TAB(38); "¦ "; " ARRIVALS "; TAB(50);
      LPRINT "¦"; "OF ARR."; TAB(58); "¦ "; "    LIMIT  "; TAB(74); "¦ "
      LPRINT TAB(6); STRING$(68, "_")
      GGG = 0
      FOR C = 1 TO NOCOUNT
      CUM = 0
      GGG = GGG + (TOT(C, DAY) / (SNOWKS))
      NEXT C
      FOR C = 1 TO NOCOUNT
      LPRINT TAB(6); "¦ "; : LPRINT USING "#####"; TOT(C, DAY);
      LPRINT TAB(18); "¦ "; : LPRINT USING "###"; C;
```

```
      IND% = (TOT(C, DAY) / (SNOWKS))
      LPRINT TAB(28); "¦ "; : LPRINT USING "####"; IND%;
      LPRINT TAB(38); "¦ ";
      CUM = CUM + IND%
      LPRINT USING "####"; CUM;
      LPRINT TAB(50); "¦";
      LPRINT USING "#.##"; CUM / GGG;
      PPPT% = (CUM / GGG) * 100
      LMTC(C, DAY) = PPPT%
      IF C = 1 AND LMTC(C, DAY) = 0 THEN 5300
      IF C > 1 THEN IF (LMTC((C - 1), DAY) = LMTC(C, DAY)) THEN 5300
      IF C = 1 THEN LPRINT TAB(58); "¦  0";
      IF C > 1 THEN LPRINT TAB(58); "¦ ";
                              : LPRINT USING "##"; ((LMTC((C - 1), DAY)) + 1);
      LPRINT " - ";
      IF C < NOCOUNT THEN LPRINT USING "##"; LMTC(C, DAY);
      IF C = NOCOUNT THEN LPRINT USING "###"; LMTC(C, DAY);
5300  LPRINT TAB(74); "¦ "
      NEXT C
      LPRINT TAB(6); STRING$(68, "_")
5114  NEXT DAY
      CLOSE
      OPEN "GAPLIMIT.FIL" FOR OUTPUT AS #1
      OPEN "SERLIMIT.FIL" FOR OUTPUT AS #2
      OPEN "CNTLIMIT.FIL" FOR OUTPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR D = 1 TO NOWDYS
      FOR L = 1 TO TTMM
      WRITE #1, LMTG(L, C, D)
      NEXT L
      FOR N = 1 TO MMTT
      WRITE #2, LMTS(N, C, D)
      NEXT N
      WRITE #3, LMTC(C, D)
      NEXT D
      NEXT C
      CLOSE
      GOTO 41
5400  REM SUB FOR RETRIEVE OF LIMITS FROM FILES FOR SIMULATION ******************
      CLOSE
      OPEN "SAMARGAP.FIL" FOR INPUT AS #1
      OPEN "SAMSER.FIL" FOR INPUT AS #2
      INPUT #1, TTMM, TT1
      INPUT #2, MMTT, TT2
      CLOSE
      OPEN "GAPLIMIT.FIL" FOR INPUT AS #1
      OPEN "SERLIMIT.FIL" FOR INPUT AS #2
      OPEN "CNTLIMIT.FIL" FOR INPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR D = 1 TO NOWDYS
      FOR L = 1 TO TTMM
      INPUT #1, LMTG(L, C, D)
      NEXT L
      FOR N = 1 TO MMTT
      INPUT #2, LMTS(N, C, D)
      NEXT N
      INPUT #3, LMTC(C, D)
      NEXT D
      NEXT C
      CLOSE
      RETURN
```

```
5500 REM GENERATION OF RANDOM NO. FOR SERV.TIM & ARR.GAP **********************
     RANDOMIZE (TIMER)
     RNDNO = RND
     RNDNO = FIX(RNDNO * 1000)
     RETURN
5550 REM GENERATION OF RANDOM NO.FOR COUNTER NO ********************************
     RANDOMIZE TIMER
     RNDNO = RND
     RNDNO = FIX(RNDNO * 100)
     RETURN
5600 REM SUB FOR FINDING THE ARR.GAP CLASS IN WHICH RANDOM NO.FALLS ***********
     FOR N = 1 TO TTMM
     IF RNDNO < LMTG(N, CNT, D) THEN SARGAP = (N) * 60: RETURN
     NEXT N
     PRINT "ERROR"
     STOP
5700 REM SUB FOR FINDING THE SERV.TIME CLASS IN WHICH RANDOM NO.FALLS *********
     FOR L = 1 TO MMTT
     IF RNDNO < LMTS(L, CNT, D) THEN SSERTIM = (L) * 60: RETURN
     NEXT L
     PRINT "ERROR"
     STOP
5800 REM SUB FOR FINDING THE COUNT NO. W.R.T. RANDOM NO. **********************
     FOR C = 1 TO NOCOUNT
     IF RNDNO < LMTC(C, D) THEN CNT = C: RETURN
     NEXT C
     PRINT "ERROR"
     STOP
5900 REM CALCULATION OF SIMULATION DATE ****************************************
     MNDAY = VAL(LEFT$(DT$, 2)): M$ = MID$(DT$, 4, 2)
     MNDAY = MNDAY + 1: Y$ = RIGHT$(DT$, 2)
     IF M$ = "01" THEN NDYM = 31: MONT$ = "JAN": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "02": GOTO 5950
     IF M$ = "02" THEN NDYM = 28: MONT$ = "FEB": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "03": GOTO 5950
     IF M$ = "03" THEN NDYM = 31: MONT$ = "MAR": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "04": GOTO 5950
     IF M$ = "04" THEN NDYM = 30: MONT$ = "APR": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "05": GOTO 5950
     IF M$ = "05" THEN NDYM = 31: MONT$ = "MAY": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "06": GOTO 5950
     IF M$ = "06" THEN NDYM = 30: MONT$ = "JUN": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "07": GOTO 5950
     IF M$ = "07" THEN NDYM = 31: MONT$ = "JUL": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "08": GOTO 5950
     IF M$ = "08" THEN NDYM = 31: MONT$ = "AUG": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "09": GOTO 5950
     IF M$ = "09" THEN NDYM = 30: MONT$ = "SEP": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "10": GOTO 5950
     IF M$ = "10" THEN NDYM = 31: MONT$ = "OCT": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "11": GOTO 5950
     IF M$ = "11" THEN NDYM = 30: MONT$ = "NOV": IF MNDAY > NDYM THEN MNDAY = 1
     : M$ = "12": GOTO 5950
     IF M$ = "12" THEN NDYM = 31: MONT$ = "DEC": IF MNDAY > NDYM THEN M$ = "01"
     : Y$ = LTRIM$(STR$((VAL(RIGHT$(DT$, 2)) + 1))): MNDAY = 1
5950 DT$ = STR$(MNDAY) + "/" + M$ + "/" + Y$
     IF MNDAY < 10 THEN DT$ = "0" + LTRIM$(DT$)
     DT$ = LTRIM$(DT$)
     RETURN
```

```
6000 '          ***********************************************
'               *   SUB FOR DRAWING SCREEN BOXES OF ANY SIZE  *
'               ***********************************************
     FOR I = X TO X + Z: LOCATE I, Y: PRINT CHR$(186)
     LOCATE I, Y + W - 1: PRINT CHR$(186): NEXT I
     LOCATE X, Y: PRINT STRING$(W, CHR$(205))
     LOCATE X + Z, Y: PRINT STRING$(W, CHR$(205)): GOSUB 6250: RETURN
6230 LOCATE R, C: PRINT CHR$(204); STRING$(L, CHR$(205)); CHR$(185): RETURN
6240 LOCATE R, C: PRINT CHR$(203): FOR I = 1 TO L: LOCATE R + I, C
     PRINT CHR$(186)
6245 NEXT I: LOCATE R + L, C: PRINT CHR$(202): RETURN
6250 LOCATE X, Y: PRINT CHR$(201)
6260 LOCATE X, Y + W - 1: PRINT CHR$(187)
6270 LOCATE X + Z, Y: PRINT CHR$(200)
6280 LOCATE X + Z, Y + W - 1: PRINT CHR$(188): RETURN
7000 REM DATA ANALYSIS MAIN MENU SECTION*****************************************
     CLS : X = 8: Y = 12: Z = 7: W = 60: GOSUB 6000
     CLOSE
     LOCATE 6, 23: PRINT "QUEUING SYSTEM'S DATA ANALYSIS"
     LOCATE 7, 20: PRINT "****************************************"
     LOCATE 10, 18: PRINT "1].       SAMPLE DATA ANALYSIS"
     LOCATE 12, 18: PRINT "2].       SIMULATED  DATA ANALYSIS"
     LOCATE 14, 18: PRINT "3].       EXIT TO THE MAI MENU"
     LOCATE 19, 27: PRINT "SELECT 1 TO 3 FROM MENU"
7010 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 7015
     GOTO 7020
7015 ABB$ = "SAMPLE DATA"
     FIL2$ = "SAMPNO2.FIL": FIL8$ = "SAMTDAT.FIL"
     OPEN "MASTFIL.FIL" FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF
'                                              , NOWKS, NOWDYS, TYPE$
     CLOSE
     GOTO 7050
7020 IF X$ = "2" THEN GOTO 7025
     GOTO 7030
7025 ABB$ = "SIMULATED DATA": FIL2$ = "SIMUNO2.FIL":
     FIL8$ = "SIMTDAT.FIL"
     OPEN "SMASTFIL.FIL" FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS
'                                                       , NOWDYS, TYPE$
     CLOSE
     GOTO 7050
7030 IF X$ = "3" THEN 41
     GOTO 7010
7050 REM DATA ANALYSIS SECTION ***************************************************
     CLOSE
     OPEN FIL2$ FOR INPUT AS #2
     OPEN FIL8$ FOR INPUT AS #3
     FOR C = 1 TO NOCOUNT
     GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
     INPUT #2, TOTL(1, C), TOTL(2, C), TOTL(3, C), TOTL(4, C), TOTL(5, C)
                                                 , TOTL(6, C), TOTL(7, C)
     INPUT #3, TOTWATM(C), TOTSER(C), TOTARGP(C), TOTFCTM(C)
     IF X$ = "S" OR X$ = "s" THEN 7111
     GOSUB 7200
7111 NEXT C
     GOTO 41
```

```
7200 REM CALCULATION OF ..SATATISTICAL VALUES...*********************************
     TOT = 0
     AVFCTM = 0: AVWTM = 0: AVRST = 0: AVRGP = 0: Y = 0
     TOT = TOTL(1, C) + TOTL(2, C) + TOTL(3, C) + TOTL(4, C) + TOTL(5, C) + TOTL
(6, C) + TOTL(7, C)
     IF TOTSER(C) > 0 AND TOTARGP(C) > 0 THEN Y = TOTSER(C) / TOTARGP(C)
     IF TOTARGP(C) > 0 AND TOT > 0 THEN AVRGP = TOTARGP(C) / TOT: : CONVTIM = AV
RGP: GOSUB 13000: AVRGP = CONVTIM
     IF TOTSER(C) > 0 AND TOT > 0 THEN AVRST = TOTSER(C) / TOT: CONVTIM = AVRST:
 GOSUB 13000: AVRST = CONVTIM
     IF TOTWATM(C) > 0 AND TOT > 0 THEN AVWTM = TOTWATM(C) / TOT: CONVTIM = AVWT
M: GOSUB 13000: AVWTM = CONVTIM
     IF TOTFCTM(C) > 0 THEN AVFCTM = TOTFCTM(C) / (NOWDYS * NOWKS): CONVTIM = AV
FCTM: GOSUB 13000: AVFCTM = CONVTIM
     NOWH = A14 - A13 - A15 + A16
     AP = 100 * (TOTSER(C) / (NOWH * 3600 * NOWDYS * NOWKS))
     LPRINT TAB(15); "QUEUING SYSTEM INFORMATION w.r.t. "; ABB$
     LPRINT TAB(12); "************************************************************"
     LPRINT
     LPRINT TAB(35); " FOR COUNT NO:"; C
     LPRINT
     LPRINT TAB(10); NOWKS; " WEEKS OF "; ABB$
     LPRINT TAB(10); "TOTAL NO OF ARRIVAL OF CUST. :"; TOT
     LPRINT TAB(10); "AVERAGE NO OF ARRIVAL / DAY  :";
     LPRINT USING "####"; TOT / (NOWDYS * NOWKS)
     LPRINT TAB(10); "AVERAGE WATING TIME/CUSTOMER :";
     TMPTM = AVWTM: GOSUB 11000: GOSUB 7300
     LPRINT TAB(10); "AVERAGE SERVICE TIME/CUSTOMER:";
     TMPTM = AVRST: GOSUB 11000: GOSUB 7300
     LPRINT TAB(10); "AVERAGE ARRIVAL GAP :";
     TMPTM = AVRGP: GOSUB 11000: GOSUB 7300
     LPRINT TAB(10); "AVERAGE COUNT.IDLE TIME/DAY  :";
     TMPTM = AVFCTM: GOSUB 11000: GOSUB 7300
     LPRINT TAB(10); "TRAFFIC INTENSITY ..........: ";
     LPRINT USING "#.##"; Y
     LPRINT TAB(10); "SERVER UTILISATION ..........:"; : LPRINT USING "###.##";
AP;
     LPRINT "%"
     LPRINT : LPRINT
     RETURN
7300 '*****************************************************
'     *                                                   *
'     *       PRINTING STATISTICAL MEASURES IN            *
'     *        nn Hour nn Minutes nn Seconds              *
'     *                                                   *
'     *****************************************************
     IF T1 > 0 THEN LPRINT T1; " Hours ";
     IF T6 > 0 THEN LPRINT T6; " Minutes ";
     IF T3% > 0 THEN LPRINT T3%; " Seconds "
     RETURN
8000 REM DATA LISTING MAIN MENU SECTION ***************************************
     CLS : X = 7: Y = 14: Z = 10: W = 56: GOSUB 6000
     LOCATE 4, 24: PRINT "  QUEUING SYSTEM'S DATA LISTING"
     LOCATE 5, 22: PRINT "************************************"
     LOCATE 9, 17: PRINT "1].  VIEW ON SCREEN"
     LOCATE 12, 17: PRINT "2].  PRINT OUT"
     LOCATE 15, 17: PRINT "3].  EXIT TO THE MAIN MENU"
     LOCATE 22, 15: PRINT "SELECT 1...3 FROM MENU RELATING TO YOUR CHOICE"
8005 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 8100
     IF X$ = "2" THEN 8200
     IF X$ = "3" THEN 41
     GOTO 8005
```

```
8100 REM LIST OF  DATA ON SCREEN*************************************************
     CLS : X = 8: Y = 12: Z = 7: W = 60: GOSUB 6000
     CLOSE
     LOCATE 6, 20: PRINT "      QUEUING SYSTEM'S DATA LISTING"
     LOCATE 7, 20: PRINT "*****************************************"
     LOCATE 10, 18: PRINT "1].       SAMPLE DATA LIST"
     LOCATE 12, 18: PRINT "2].       SIMULATION 'S RESULTS LIST"
     LOCATE 14, 18: PRINT "3].       EXIT TO THE MAI MENU"
     LOCATE 19, 27: PRINT "SELECT 1 TO 3 FROM MENU"
     OPEN "MASTFIL.FIL" FOR INPUT AS #1
     INPUT #1, TCSTIM, TCCTIM, ISCSTIM, ISCCTIM, LUNSTIM, LUNFTIM, NOCOUNT
                                        , WKDAY$, DIFF, NOWKS, NOWDYS, TYPE$
     CLOSE #1
8110 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 8115
     GOTO 8120
8115 ABB$ = "SAMPLE DATA"
     FL1$ = "SAMPDAT.FIL": FL2$ = "COMPUT.FIL": GOTO 8150
8120 IF X$ = "2" THEN GOTO 8125
     GOTO 8130
8125 ABB$ = "SIMULATED DATA"
     FL1$ = "SIMUDAT.FIL": FL2$ = "SIMCOMP.FIL": GOTO 8150
8130 IF X$ = "3" THEN 41
     GOTO 8110

8150 FOR M = 1 TO NOCOUNT
     CLS : GOSUB 8800
     OPEN FL1$ FOR INPUT AS #1
     OPEN FL2$ FOR INPUT AS #2
     NNN = 7
     WHILE NOT EOF(1)
     INPUT #1, SCUSTNO, ARTIM, CALTIM, DEPTIM, SCNT, SDT$, DAY
     INPUT #2, CCUSTNO, WATIM, SERTIM, ARGAP, FRCTIM, CCNT, CDT$, DAY
     IF CCNT <> M THEN 8170
     IF CCUSTNO = SCUSTNO AND CCNT = SCNT AND CDT$ = SDT$ THEN 8010
     CLS : LOCATE 13, 37: PRINT "ERROR": END
8010 GOSUB 8900
     LOCATE 1, 50: PRINT CDT$
     LOCATE NNN, 3: PRINT CCNT
     LOCATE NNN, 9: PRINT CCUSTNO
     LOCATE NNN, 18: PRINT USING "##.####"; ARTIM
     LOCATE NNN, 27: PRINT USING "##.####"; CALTIM
     LOCATE NNN, 36: PRINT USING "##.####"; DEPTIM
     LOCATE NNN, 46: PRINT USING "##.####"; ARGAP
     LOCATE NNN, 54: PRINT USING "##.####"; SERTIM
     LOCATE NNN, 63: PRINT USING "##.####"; WATIM
     LOCATE NNN, 72: PRINT USING "##.####"; FRCTIM
     NNN = NNN + 1
     X$ = ""
     IF NNN >= 23 THEN LOCATE 23, 10
     INPUT "ENTER X TO GOTO MAIN MENU ELSE ANY OTHER KEY"; X$
     IF X$ = "X" OR X$ = "x" THEN 41
     IF NNN >= 23 THEN GOSUB 8800
8170 WEND
     CLOSE
     NEXT M
     GOTO 8000
8200 REM LIST OF DATA ON PRINTER ************************************************
     CLS : X = 8: Y = 12: Z = 7: W = 60: GOSUB 6000
     CLOSE
```

```
     LOCATE 6, 20: PRINT "      QUEUING SYSTEM'S DATA LISTING"
     LOCATE 7, 20: PRINT "*****************************************"
     LOCATE 10, 18: PRINT "1].      SAMPLE DATA LIST"
     LOCATE 12, 18: PRINT "2].      SIMULATION 'S RESULTS LIST"
     LOCATE 14, 18: PRINT "3].      EXIT TO THE MAI MENU"
     LOCATE 19, 27: PRINT "SELECT 1 TO 3 FROM MENU"
     OPEN "MASTFIL.FIL" FOR INPUT AS #1
     INPUT #1, TCSTIM, TCCTIM, ISCSTIM, ISCCTIM, LUNSTIM, LUNFTIM, NOCOUNT
                                    , WKDAY$, DIFF, NOWKS, NOWDYS, TYPE$
     CLOSE #1
8310 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 8315
     GOTO 8320
8315 ABB$ = "SAMPLE DATA"
     FL1$ = "SAMPDAT.FIL": FL2$ = "COMPUT.FIL": GOTO 8350
8320 IF X$ = "2" THEN GOTO 8325
     GOTO 8330
8325 ABB$ = "SIMULATED DATA"
     FL1$ = "SIMUDAT.FIL": FL2$ = "SIMCOMP.FIL": GOTO 8350
8330 IF X$ = "3" THEN 41
     GOTO 8310
8350 FOR M = 1 TO NOCOUNT
     OPEN FL1$ FOR INPUT AS #1
     OPEN FL2$ FOR INPUT AS #2
     NNN = 7: PAGE = 0: PDT$ = ""
     WHILE NOT EOF(1)
     INPUT #1, SCUSTNO, ARTIM, CALTIM, DEPTIM, SCNT, SDT$, DAY
     INPUT #2, CCUSTNO, WATIM, SERTIM, ARGAP, FRCTIM, CCNT, CDT$, DAY
     IF CCNT <> M THEN 8270
     IF CCUSTNO = SCUSTNO AND CCNT = SCNT AND SDT$ = CDT$ THEN 8210
     CLS : LOCATE 13, 37: PRINT "ERROR": END
8210 IF SDT$ <> PDT$ AND PAGE > 0 THEN LPRINT TAB(9); STRING$(71, "-")
     IF SDT$ <> PDT$ THEN GOSUB 8700: PDT$ = SDT$
     GOSUB 8900
     LPRINT TAB(9); "¦"; : LPRINT USING "###"; CCUSTNO;
     LPRINT TAB(18); "¦"; : LPRINT USING "##.####"; ARTIM;
     LPRINT TAB(27); "¦"; : LPRINT USING "##.####"; CALTIM;
     LPRINT TAB(36); "¦"; : LPRINT USING "##.####"; DEPTIM;
     LPRINT TAB(45); "¦"; : LPRINT USING "##.####"; ARGAP;
     LPRINT TAB(54); "¦"; : LPRINT USING "##.####"; SERTIM;
     LPRINT TAB(63); "¦"; : LPRINT USING "##.####"; WATIM;
     LPRINT TAB(72); "¦"; : LPRINT USING "##.####"; FRCTIM;
     LPRINT TAB(80); "¦"
     NNN = NNN + 1
     IF NNN >= 55 THEN LPRINT TAB(9); STRING$(71, "-"): GOSUB 8700
8270 WEND
     LPRINT TAB(9); "¦"; TAB(18); "¦"; TAB(27); "¦"; TAB(36); "¦"; TAB(45); "¦";
     LPRINT TAB(54); "¦"; TAB(63); "¦"; TAB(72); "¦"; TAB(80); "¦"
     LPRINT TAB(9); STRING$(71, "-")
     CLOSE
     NEXT M
     GOTO 8000
8700 GOSUB 19000: IF X$ = "X" OR X$ = "x" THEN 41
     GOSUB 19100
     PAGE = PAGE + 1
     WIDTH LPRINT 132
     LPRINT TAB(27); "    "; ABB$; " LIST OF "; CDT$
     LPRINT TAB(25); "*********************************  PAGE: "; PAGE
     LPRINT TAB(35); "COUNTER NO. "; SCNT
     NNN = 7
```

```
      LPRINT TAB(9); STRING$(71, "-")
      LPRINT TAB(9); "¦  CUST."; TAB(18); "¦ ARRIV.";
      LPRINT TAB(27); "¦  CALL "; TAB(36); "¦ DEPTU "; TAB(45); "¦ ARRIV.";
      LPRINT TAB(54); "¦  SERV."; TAB(63); "¦ WATING"; TAB(72); "¦ COUNT.";
      LPRINT TAB(80); "¦"
      LPRINT TAB(9); "¦  NO.";
      LPRINT TAB(18); "¦  TIME";
      LPRINT TAB(27); "¦  TIME";
      LPRINT TAB(36); "¦  TIME ";
      LPRINT TAB(45); "¦  GAP";
      LPRINT TAB(54); "¦  TIME";
      LPRINT TAB(63); "¦  TIME";
      LPRINT TAB(72); "¦IDL.TIME";
      LPRINT TAB(80); "¦"
      LPRINT TAB(9); STRING$(71, "-")
      LPRINT TAB(9); "¦"; TAB(18); "¦"; TAB(27); "¦"; TAB(36); "¦"; TAB(45); "¦";
      LPRINT TAB(54); "¦"; TAB(63); "¦"; TAB(72); "¦"; TAB(80); "¦"
      RETURN
8800  CLS :  LOCATE 1, 27: PRINT ABB$; " LIST FOR"
      LOCATE 2, 25: PRINT "************************************"
      X = 3: Y = 2: Z = 20: W = 79: GOSUB 6000:
      NNN = 7
      LOCATE 4, 3: PRINT " CNT."
      LOCATE 4, 9: PRINT "  CUST."
      LOCATE 4, 18: PRINT " ARRIV."
      LOCATE 4, 27: PRINT "  CALL "
      LOCATE 4, 36: PRINT " DEPTU "
      LOCATE 4, 45: PRINT " ARRIV."
      LOCATE 4, 54: PRINT "  SERV."
      LOCATE 4, 63: PRINT " WATING"
      LOCATE 4, 72: PRINT " COUNT."
      LOCATE 5, 3: PRINT "  NO."
      LOCATE 5, 9: PRINT "  NO."
      LOCATE 5, 18: PRINT "  TIME"
      LOCATE 5, 27: PRINT "  TIME"
      LOCATE 5, 36: PRINT "  TIME "
      LOCATE 5, 45: PRINT "  GAP"
      LOCATE 5, 54: PRINT "  TIME"
      LOCATE 5, 63: PRINT "  TIME"
      LOCATE 5, 72: PRINT "IDL.TIME"
      R = 6: C = 2: L = 77: GOSUB 6230
      C = 8: R = 3: L = 20: GOSUB 6240
      C = 17: R = 3: L = 20: GOSUB 6240
      C = 26: R = 3: L = 20: GOSUB 6240
      C = 35: R = 3: L = 20: GOSUB 6240
      C = 44: R = 3: L = 20: GOSUB 6240
      C = 53: R = 3: L = 20: GOSUB 6240
      C = 62: R = 3: L = 20: GOSUB 6240
      C = 71: R = 3: L = 20: GOSUB 6240
      RETURN
8900  REM SUB FOR PREPARATION OF TIME CONVERTION TO HOUR SYSTEM*****************
      CONVTIM = ARTIM: GOSUB 13000: ARTIM = CONVTIM
      CONVTIM = CALTIM: GOSUB 13000: CALTIM = CONVTIM
      CONVTIM = DEPTIM: GOSUB 13000: DEPTIM = CONVTIM
      CONVTIM = WATIM: GOSUB 13000: WATIM = CONVTIM
      CONVTIM = SERTIM: GOSUB 13000: SERTIM = CONVTIM
      CONVTIM = ARGAP: GOSUB 13000: ARGAP = CONVTIM
      CONVTIM = FRCTIM: GOSUB 13000: FRCTIM = CONVTIM
      RETURN
```

```
9000 REM GRAPH MENU FOR DRAWING SAMP/SIMUL. DATA GRAPHS ************************
     GOSUB 4600: REM INITIALISATION OF SUBSCRIPT VARIABLES **********************
     CLS : X = 8: Y = 12: Z = 7: W = 60: GOSUB 6000
     CLOSE
     LOCATE 6, 23: PRINT "SIMULATION OF QUEUING SYSTEM'S GRAPH MENU"
     LOCATE 7, 20: PRINT "*********************************************"
     LOCATE 10, 18: PRINT "1].       SAMPLE DATA GRAPH"
     LOCATE 12, 18: PRINT "2].       SIMULATION 'S RESULTS GRAPH"
     LOCATE 14, 18: PRINT "3].       EXIT TO THE MAI MENU"
     LOCATE 19, 27: PRINT "SELECT 1 TO 3 FROM MENU"
9010 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 9015
     GOTO 9020
9015 ABB$ = "SAMPLE DATA": FIL1$ = "SAMPNO1.FIL"
     FIL2$ = "SAMPNO2.FIL": FIL3$ = "SAMPNO3.FIL"
     FIL6$ = "SAMARGAP.FIL": FIL7$ = "SAMSER.FIL"
     FIL8$ = "SAMTDAT.FIL"
     OPEN "MASTFIL.FIL" FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS
                                                          , NOWDYS, TYPE$
     CLOSE
     FIL4$ = "SAMPNO4.FIL": FIL5$ = "SAMPNO5.FIL": GOTO 9050
9020 IF X$ = "2" THEN GOTO 9025
     GOTO 9030
9025 ABB$ = "SIMULATED DATA": FIL1$ = "SIMUNO1.FIL": FIL2$ = "SIMUNO2.FIL":
     FIL5$ = "SIMUNO5.FIL": FIL3$ = "SIMUNO3.FIL": FIL4$ = "SIMUNO4.FIL"
     FIL6$ = "SIMARGAP.FIL": FIL7$ = "SIMSER.FIL"
     FIL8$ = "SIMTDAT.FIL"
     OPEN "SMASTFIL.FIL" FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF
                                          , NOWKS, NOWDYS, TYPE$
     CLOSE
     GOTO 9050
9030 IF X$ = "3" THEN 41
     GOTO 9010
9050 CLS : X = 6: Y = 10: Z = 14: W = 68: GOSUB 6000
     LOCATE 4, 17: PRINT "SIMULATION OF QUEUING SYSTEM "; ABB$; " GRAPH MENU"
     LOCATE 5, 15: PRINT "*****************************************************"
     LOCATE 7, 12: PRINT "1].    NO.OF ARIV.V/S.WEEK DAYS"
     LOCATE 9, 12: PRINT "2].    NO.OF ARIV.V/S.HOURS OF THE DAY"
     LOCATE 11, 12: PRINT "3].   NO.OF ARIV.V/S.WEEK DAYS OF EACH COUN."
     LOCATE 13, 12: PRINT "4].   NO.OF ARIV.V/S.HOURS OF THE DAY OF EACH COUN."
     LOCATE 15, 12: PRINT "5].   SERVICE TIME GRAPH"
     LOCATE 17, 12: PRINT "6].   ARRIVAL GAP GRAPH"
     LOCATE 19, 12: PRINT "7].   EXIT TO THE GRAPH MAIN MENU"
     LOCATE 21, 27: PRINT "SELECT 1 TO 7 FROM MENU"
9055 X$ = "": X$ = INKEY$
     IF X$ = "1" THEN 9100
     IF X$ = "2" THEN 9200
     IF X$ = "3" THEN 9300
     IF X$ = "4" THEN 9400
     IF X$ = "5" THEN 9500
     IF X$ = "6" THEN 9600
     IF X$ = "7" THEN 9000
     GOTO 9055
9100 REM GRAPH FOR NO. OF ARRIVALS VERSUS WEEK DAYS ****************************
     GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
     OPEN FIL1$ FOR INPUT AS #1
     INPUT #1, GCTOTAL, GTOTAL1, GTOTAL2, GTOTAL3, GTOTAL4, GTOTAL5, GTOTAL6
```

```
      GOSUB 9700
      LPRINT TAB(10); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF ";
      LPRINT ABB$
      LPRINT TAB(35); " FOR THE WHOLE SYSTEM"
      GOTO 9000

9200  REM GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY ****************
      FOR T = 1 TO 20: GTOTA(T) = 0: NEXT T
      ZZZ = 7: XXX = 15
      IF A11 = 0 THEN K = FIX(A14) - FIX(A13) + 1: S = FIX(A13): GOTO 9205
      K = FIX(A14) - FIX(A11) + 1: S = FIX(A11): GOTO 9205
9205  OPEN FIL4$ FOR INPUT AS #4
      FOR T = 1 TO K
      INPUT #4, GTOTA(T)
      NEXT T
      CLOSE
      GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
      WIDTH LPRINT 132
      LPRINT TAB(20); "X AXIS :HOURS OF THE DAY"
      GOSUB 9800
      R = 14: SS1 = S
      FOR P = 1 TO K
      D34$ = LTRIM$(STR$(SS1)) + "-" + LTRIM$(STR$(SS1 + 1))
      LPRINT TAB(R); D34$;
      R = R + ZZZ
      SS1 = SS1 + 1
      NEXT P
      LPRINT : LPRINT
      LPRINT TAB(12); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY"
      LPRINT TAB(35); "FOR THE WHOLE SYSTEM FOR"; ABB$
      GOTO 9000

9300  REM GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF EACH COUNTER ***
      OPEN FIL2$ FOR INPUT AS #2
      FOR C = 1 TO NOCOUNT
      GTOTAL1 = 0: N1% = 0
      GTOTAL2 = 0: N2% = 0
      GTOTAL3 = 0: N3% = 0
      GTOTAL4 = 0: N4% = 0
      GTOTAL5 = 0: N5% = 0
      GTOTAL6 = 0: N6% = 0
      GTOTAL8 = 0: N7% = 0
      GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
      INPUT #2, GTOTAL1, GTOTAL2, GTOTAL3, GTOTAL4, GTOTAL5, GTOTAL6, GTOTAL7
      GOSUB 9700
      LPRINT TAB(10); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF ";
      LPRINT ABB$
      LPRINT TAB(35); "FOR "; ABB$; " FOR THE ";
      GOSUB 9950
      NEXT C
      CLOSE
      GOTO 9000
9400  REM GRAPH FOR NO. OF ARRIVALS VERSUS HOURS OF DAY OF EACH COUNTER ********
      ZZZ = 7: XXX = 15
      IF A11 = 0 THEN K = FIX(A14) - FIX(A13) + 1: S = FIX(A13): GOTO 9405
      K = FIX(A14) - FIX(A11) + 1: S = FIX(A11): GOTO 9405
9405  OPEN FIL3$ FOR INPUT AS #3
      FOR C = 1 TO NOCOUNT
      FOR T = 1 TO 45: GTOTA(T) = 0: NEXT T
      FOR T = 1 TO K
      INPUT #3, GTOTA(T)
```

```
      NEXT T
      GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
      WIDTH LPRINT 132
      LPRINT TAB(20); "X AXIS :HOURS OF THE DAY"
      GOSUB 9800
      R = 14: SS1 = S
      FOR P = 1 TO K
      D34$ = LTRIM$(STR$(SS1)) + "-" + LTRIM$(STR$(SS1 + 1))
      LPRINT TAB(R); D34$;
      R = R + ZZZ
      SS1 = SS1 + 1
      NEXT P
      LPRINT : LPRINT
      LPRINT TAB(12); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY"
      LPRINT TAB(30); "FOR "; ABB$; " FOR THE ";
      GOSUB 9950
      NEXT C
      CLOSE
      GOTO 9000

9500  REM GRAPH FOR NO. OF ARRIVALS VERSUS SERVICE TIME ************************
      ZZZ = 6: XXX = 12
      OPEN FIL7$ FOR INPUT AS #2
      INPUT #2, MMTT, P
      CLOSE
      OPEN FIL7$ FOR INPUT AS #2
      K = MMTT
      FOR C = 1 TO NOCOUNT
      FOR T = 1 TO MMTT: GTOTA(T) = 0: NEXT T
      FOR DAY = 1 TO NOWDYS
      FOR T = 1 TO MMTT
      INPUT #2, MMTT, GT
      GTOTA(T) = GTOTA(T) + GT
      NEXT T
      NEXT DAY
      GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
      IF X$ = "S" OR X$ = "s" THEN 9580
      WIDTH LPRINT 132
      WIDTH LPRINT 255
      LPRINT CHR$(27); "M"; CHR$(15)
      LPRINT CHR$(27); "~80"
      LPRINT TAB(35); "X AXIS :SERVICE TIME IN MINITES"
      GOSUB 9800
      R = 12
      FOR P = 1 TO MMTT
      IF GTOTA(P) <= 0 THEN 9560
      D34$ = "< " + LTRIM$(STR$(P))
      LPRINT TAB(R); D34$;
      R = R + ZZZ
9560  NEXT P
      R = 12
      FOR P = 1 TO MMTT
      IF GTOTA(P) <= 0 THEN 9555
      D34$ = "> " + LTRIM$(STR$(P - 1))
      LPRINT TAB(R); D34$;
      R = R + ZZZ
9555  NEXT P
      R = 12
      FOR P = 1 TO MMTT
      IF GTOTA(P) <= 0 THEN 9570
      LPRINT TAB(R); "MIN.";
```

```
9700 REM GRAPH DRAWIG SUB ROUTINE FOR DAYS OF THE WEEK ************************
     WIDTH LPRINT 132
     DAY = 1: GOSUB 4500: WKD1$ = WD$
     DAY = 2: GOSUB 4500: WKD2$ = WD$
     DAY = 3: GOSUB 4500: WKD3$ = WD$
     DAY = 4: GOSUB 4500: WKD4$ = WD$
     DAY = 5: GOSUB 4500: WKD5$ = WD$
     DAY = 6: GOSUB 4500: WKD6$ = WD$
     DAY = 7: GOSUB 4500: WKD7$ = WD$
     IF GTOTAL1 > 0 THEN N1% = GTOTAL1 / (NOWKS): GL1% = GTOTAL1 / NOWKS
     IF GTOTAL2 > 0 THEN N2% = GTOTAL2 / (NOWKS): GL2% = GTOTAL2 / NOWKS
     IF GTOTAL3 > 0 THEN N3% = GTOTAL3 / (NOWKS): GL3% = GTOTAL3 / NOWKS
     IF GTOTAL4 > 0 THEN N4% = GTOTAL4 / (NOWKS); GL4% = GTOTAL4 / NOWKS
     IF GTOTAL5 > 0 THEN N5% = GTOTAL5 / (NOWKS): GL5% = GTOTAL5 / NOWKS
     IF GTOTAL6 > 0 THEN N6% = GTOTAL6 / (NOWKS): GL6% = GTOTAL6 / NOWKS
     IF GTOTAL7 > 0 THEN N7% = GTOTAL7 / (NOWKS): GL7% = GTOTAL7 / NOWKS
     BIG = N1%: SMAL = N1%
     IF BIG < N2% THEN BIG = N2%
     IF BIG < N3% THEN BIG = N3%
     IF BIG < N4% THEN BIG = N4%
     IF BIG < N5% THEN BIG = N5%
     IF BIG < N6% THEN BIG = N6%
     IF BIG < N7% THEN BIG = N7%
     IF SMAL > N2% THEN SMAL = N2%
     IF SMAL > N3% THEN SMAL = N3%
     IF SMAL > N4% THEN SMAL = N4%
     IF SMAL > N5% THEN SMAL = N5%
     IF SMAL > N6% THEN SMAL = N6%
     IF SMAL > N7% THEN SMAL = N7%
     SWITCH3 = 0
     AAA = ((FIX(BIG / 10)) + 1) * 10
     LLL% = ((BIG - SMAL)) / 30
     DDD = 1: H = 0
     N = 0
     IF LLL% = 0 THEN LLL% = 30 / (BIG - SMAL): SWITCH3 = 1: N = 1
     SWITCH1 = 0: SWITCH2 = 0: Q1 = 0: Q2 = 0: Q3 = 0: Q4 = 0: Q5 = 0: Q6 = 0
     Q7 = 0:
     LPRINT TAB(8); "^ Y AXIS"; TAB(20); "Y AXIS :AVERAGE NO OF ARRIVALS/DAY"
     LPRINT TAB(2); AAA; TAB(8); "¦"; TAB(20); "X AXIS :DAYS OF THE WEEK"
9705 IF AAA <= SMAL AND SWITCH1 = 0 THEN LPRINT TAB(2); SMAL; : SWITCH1 = 1
     GOTO 9710
     IF AAA <= BIG AND SWITCH2 = 0 THEN LPRINT TAB(2); BIG; : SWITCH2 = 1
     GOTO 9710
     IF (DDD = 5 OR DDD = 10 OR DDD = 15 OR DDD = 30) AND SWITCH4 = 0 THEN 9706
     IF (DDD = 20 OR DDD = 35) AND SWITCH4 = 0 THEN 9706
     GOTO 9710
9706 IF H > 2 THEN GOTO 9710
     IF BIG = AAA OR SMAL = AAA THEN 9710
     LPRINT TAB(2); AAA;
     SWITCH4 = 1
9710 IF SWITCH1 = 1 THEN H = H + 1
     LPRINT TAB(8); "¦";
     IF N1% >= AAA THEN LPRINT TAB(12); "*"; : IF Q1 = 0 THEN LPRINT GL1%; :
                                                              Q1 = 1
     IF N2% >= AAA THEN LPRINT TAB(22); "*"; : IF Q2 = 0 THEN LPRINT GL2%; :
                                                              Q2 = 1
     IF N3% >= AAA THEN LPRINT TAB(32); "*"; : IF Q3 = 0 THEN LPRINT GL3%; :
                                                              Q3 = 1
     IF N4% >= AAA THEN LPRINT TAB(42); "*"; : IF Q4 = 0 THEN LPRINT GL4%; :
                                                              Q4 = 1
     IF N5% >= AAA THEN LPRINT TAB(52); "*"; : IF Q5 = 0 THEN LPRINT GL5%; :
```

```
     R = R + ZZZ
9570 NEXT P
     LPRINT : LPRINT
     LPRINT TAB(42); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS SERVICE TIME"
     LPRINT TAB(55); "FOR "; ABB$; " FOR THE "; : GOSUB 9950:
9580 LPRINT CHR$(27); "@"
     NEXT C
     CLOSE
     GOTO 9000
9600 REM GRAPH FOR NO. OF ARRIVALS VERSUS ARRIVAL GAP **************************
     OPEN FIL6$ FOR INPUT AS #1
     INPUT #1, TTMM, P
     CLOSE
     ZZZ = 6: XXX = 12
     OPEN FIL6$ FOR INPUT AS #1
     K = TTMM
     FOR C = 1 TO NOCOUNT
     FOR T = 1 TO TTMM: GTOTA(T) = 0: NEXT T
     FOR DAY = 1 TO NOWDYS
     FOR T = 1 TO TTMM
     INPUT #1, TTMM, GT
     GTOTA(T) = GTOTA(T) + GT
     NEXT T
     NEXT DAY
     GOSUB 19000: GOSUB 19100: IF X$ = "X" OR X$ = "x" THEN 9000
     IF X$ = "S" OR X$ = "s" THEN 9680
     WIDTH LPRINT 132
     WIDTH LPRINT 255
     LPRINT CHR$(27); "M"; CHR$(15)
     LPRINT CHR$(27); "^80"
     LPRINT TAB(35); "X AXIS ;ARRAIVAL GAP IN MINITES"
     GOSUB 9800
     R = 12
     FOR P = 1 TO TTMM
     IF GTOTA(P) <= 0 THEN 9665
     D34$ = "<" + LTRIM$(STR$(P))
     LPRINT TAB(R); D34$;
     R = R + ZZZ
9665 NEXT P
     R = 12
     FOR P = 1 TO TTMM
     IF GTOTA(P) <= 0 THEN 9655
     D34$ = ">" + LTRIM$(STR$(P - 1))
     LPRINT TAB(R); D34$;
     R = R + ZZZ
9655 NEXT P
     R = 12
     FOR P = 1 TO TTMM
     IF GTOTA(P) <= 0 THEN 9675
     LPRINT TAB(R); "MIN.";
     R = R + ZZZ
9675 NEXT P
     LPRINT : LPRINT
     LPRINT TAB(42); "GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS ARIVAL GAP"
     LPRINT TAB(55); "FOR "; ABB$; " FOR THE ";
     GOSUB 9950
9680 LPRINT CHR$(27); "@"
     NEXT C
     CLOSE
     GOTO 9000
```

```
      IF N6% >= AAA THEN LPRINT TAB(62); "*"; : IF Q6 = 0 THEN LPRINT GL6%; :
                                                                  Q6 = 1
      IF N7% >= AAA THEN LPRINT TAB(72); "*"; : IF Q7 = 0 THEN LPRINT GL7%; :
                                                                  Q7 = 1
      IF SWITCH3 = 1 THEN 9715
      AAA = AAA - LLL%
      DDD = DDD + 1
      SWITCH4 = 0
      GOTO 9720
 9715 IF N = LLL% THEN AAA = AAA - 1
      IF N = LLL% THEN DDD = DDD + 1: SWITCH4 = 0: N = 1
      N = N + 1
 9720 IF H > 11 THEN 9725
      IF AAA > 0 THEN 9705
 9725 LPRINT TAB(2); "  0"; TAB(8); STRING$(67, "-"); ">X AXIS"
      LPRINT
      LPRINT TAB(9); WKD1$; TAB(19); WKD2$; TAB(29); WKD3$; TAB(39); WKD4$;
      LPRINT TAB(49); WKD5$; TAB(59); WKD6$; TAB(69); WKD7$
      LPRINT
      RETURN
 9800 REM GRAPH DRAWIG SUB ROUTINE FOR HOURS OF THE DAY **********************
      FOR T = 1 TO 20: AN1%(T) = 0: GL1%(T) = 0: SDEPT(T) = 0: NEXT T
      BIG = 0: SMAL = 9999
      FOR T = 1 TO K
      IF GTOTA(T) > 0 THEN AN1%(T) = GTOTA(T) / (NOWKS * NOWDYS):
                           GL1%(T) = GTOTA(T) / (NOWKS * NOWDYS): GOTO 9802
      IF GTOTA(T) <= 0 THEN 9812
 9802 IF BIG < AN1%(T) THEN BIG = AN1%(T)
      IF SMAL > AN1%(T) THEN SMAL = AN1%(T)
 9812 NEXT T
      BIG = BIG: SMAL = SMAL
      SWITCH3 = 0
      TRE$ = STR$(BIG)
      TRE$ = LTRIM$(TRE$)
      TRE$ = LEFT$(TRE$, 1)
      LLL% = ((BIG - SMAL)) / 30
      N = 0
      LLL% = ((BIG - SMAL)) / 30
      IF LLL% = 0 THEN LLL% = 30 / (BIG - SMAL): SWITCH3 = 1: N = 1
      IF N = 0 AND BIG < 10 THEN AAA = 10: LLL% = 1: GOTO 9804
      IF N = 0 AND BIG < 100 THEN AAA = (VAL(TRE$)) * 10 + 10
      IF N = 0 AND BIG < 1000 AND BIG > 99 THEN AAA = (VAL(TRE$)) * 100 + 100
      IF N = 1 THEN AAA = BIG
 9804 DDD = 1: H = 0
      SWITCH1 = 0: SWITCH2 = 0
      IF ZZZ = 6 THEN LPRINT TAB(2); AAA; "Y AXIS"; TAB(35); "Y AXIS :"
                                          AVERAGE NO OF ARRIVALS/DAY"
      IF ZZZ = 7 THEN LPRINT TAB(2); AAA; "Y AXIS"; TAB(20); "Y AXIS :"
                                          AVERAGE NO OF ARRIVALS/DAY"
 9805 IF AAA <= SMAL AND SWITCH1 = 0 THEN LPRINT TAB(2); SMAL; : SWITCH1 = 1
                                                              : GOTO 9810
      IF AAA <= BIG AND SWITCH2 = 0 THEN LPRINT TAB(2); BIG; : SWITCH2 = 1
                                                              : GOTO 9810
      IF (DDD = 5 OR DDD = 10 OR DDD = 15 OR DDD = 20) AND SWITCH4 = 0 THEN 980
      IF (DDD = 30 OR DDD = 40 OR DDD = 50) AND SWITCH4 = 0 THEN 9806
      IF (DDD = 45 OR DDD = 35 OR DDD = 25) AND SWITCH4 = 0 THEN 9806
      GOTO 9810
 9806 IF BIG = AAA OR SMAL = AAA THEN 9810
      IF H > 1 THEN GOTO 9810
      LPRINT TAB(2); AAA;
      SWITCH4 = 1
```

```
9810 IF SWITCH1 = 1 THEN H = H + 1
     LPRINT TAB(8); "¦";
     R = XXX
     FOR T = 1 TO K
     IF ZZZ = 6 AND GTOTA(T) <= 0 THEN 9885
     IF GL1%(T) >= AAA THEN LPRINT TAB(R); "*"; : IF SDEPT(T) = 0 THEN
                                          LPRINT GL1%(T); : SDEPT(T) = 1
9811 R = R + ZZZ
9885 NEXT T
     IF SWITCH3 = 1 THEN 9815
     AAA = AAA - LLL%
     DDD = DDD + 1
     SWITCH4 = 0
     GOTO 9820
9815 IF N = LLL% THEN AAA = AAA - 1
     IF N = LLL% THEN DDD = DDD + 1: SWITCH4 = 0: N = 1
     N = N + 1
9820 IF H > 14 THEN 9825
     IF AAA > 0 THEN 9805
9825 IF ZZZ = 6 THEN LPRINT TAB(2); " 0"; TAB(8); STRING$(150, "-"); ">X AXIS";
     IF ZZZ = 7 THEN LPRINT TAB(2); " 0"; TAB(8); STRING$(72, "-"); ">X AXIS"
     RETURN
9950 REM FOOT NOTE FOR COUNT NO. FOR GRAPHS ************************************
     IF C = 1 THEN LPRINT "FIRST COUNTER"
     IF C = 2 THEN LPRINT "SECOND COUNTER"
     IF C = 3 THEN LPRINT "THIRD COUNTER"
     IF C = 4 THEN LPRINT "FOURTH COUNTER"
     IF C = 5 THEN LPRINT "FIFTH COUNTER"
     IF C = 6 THEN LPRINT "SIXTH COUNTER"
     IF C = 7 THEN LPRINT "SEVENTH COUNTER"
     IF C = 8 THEN LPRINT "EIGHT COUNTER"
     IF C = 9 THEN LPRINT "NINTH COUNTER"
     IF C = 10 THEN LPRINT "TENTH COUNTER"
     IF C > 10 THEN LPRINT "NEXT COUNTER"
     RETURN
10000
'              ************************************************
'              *      SUB FOR RECALL OF INFORMATION ENTERED   *
'              *      EARLIER  IN  ORDER  TO  CONTINUE  THE   *
'              *      ENTRY OF REMAINING SAMPLE  DATA         *
'                           *
'              ************************************************
     GOSUB 4600
     OPEN "MASTFIL.FIL" FOR INPUT AS #4
     INPUT #4, A11, A12, A13, A14, A15, A16, NOCOUNT, WKDAY$, DIFF, NOWKS
                                                        , NOWDYS, TYPE$
     CLOSE #4
     OPEN "SAMARGAP.FIL" FOR INPUT AS #1
     OPEN "SAMSER.FIL" FOR INPUT AS #2
     INPUT #1, TTMM, C
     INPUT #2, MMTT, C
     CLOSE #1, #2
     OPEN "SAMARGAP.FIL" FOR INPUT AS #1
     OPEN "SAMSER.FIL" FOR INPUT AS #2
     OPEN "SAMTDAT.FIL" FOR INPUT AS #3
     FOR C = 1 TO NOCOUNT
     FOR D = 1 TO NOWDYS
     FOR N = 1 TO TTMM
     INPUT #1, TTMM, TONOARGP(N, C, D)
     NEXT N
     FOR L = 1 TO MMTT
     INPUT #2, MMTT, TOTNOSER(L, C, D)
```

```
     NEXT L
     NEXT D
     INPUT #3, TOTWATM(C), TOTSER(C), TOTARGP(C), TOTFCTM(C)
     NEXT C
     CLOSE
     IF A11 = 0 THEN K = FIX(A14) - FIX(A13) + 1: S = FIX(A13): GOTO 10005
     K = FIX(A14) - FIX(A11) + 1: S = FIX(A11)
10005 OPEN FIL1$ FOR INPUT AS #1
     INPUT #1, CTOTAL, TOTAL1, TOTAL2, TOTAL3, TOTAL4, TOTAL5, TOTAL6, TOTAL7
     CLOSE
     OPEN FIL2$ FOR INPUT AS #2
     FOR C = 1 TO NOCOUNT
     INPUT #2, TOTL(1, C), TOTL(2, C), TOTL(3, C), TOTL(4, C), TOTL(5, C)
                                                  , TOTL(6, C), TOTL(7, C)
     NEXT C
     OPEN FIL4$ FOR INPUT AS #4
     FOR T = 1 TO K
     INPUT #4, TOTA(T)
     NEXT T
     OPEN FIL3$ FOR INPUT AS #3
     FOR C = 1 TO NOCOUNT
     FOR T = 1 TO K
     INPUT #3, TOT(C, T)
     NEXT T
     NEXT C
     CLOSE
     OPEN "MASTDAT.FIL" FOR INPUT AS #1
     INPUT #1, TCSTIM, TCCTIM, ISCSTIM, ISCCTIM, LUNSTIM, LUNFTIM, NOCOUNT
                                      , WKDAY$, DIFF, NOWKS, NOWDYS, TYPE$
     CLOSE #1
     OPEN "SAMPDAT.FIL" FOR INPUT AS #1
     WHILE NOT EOF(1)
     INPUT #1, CUSTNO, ARTIM, CALTIM, DEPTIM, CNT, DT$, DAY
     WEND
     CLOSE
      CONVTIM = ARTIM: GOSUB 13000: ARTME = CONVTIM
      CONVTIM = CALTIM: GOSUB 13000: CLTME = CONVTIM
      CONVTIM = DEPTIM: GOSUB 13000: DPTME = CONVTIM
      CLS : X = 6: Y = 5: Z = 10: W = 70: GOSUB 6000
      LOCATE 3, 20: PRINT " INFORMATION OF LAST CUST. ENTERED"
      LOCATE 8, 12: PRINT "LAST CUST.NO. ENTERED:"; CUSTNO
      LOCATE 8, 57: PRINT "COUNTER NO.:"; CNT
      LOCATE 10, 12: PRINT "ARRTIME OF LTEST CUST.:";
      PRINT USING "##.####"; ARTME
      LOCATE 12, 12: PRINT "CALL TIME OF CUST.:";
      PRINT USING "##.####"; CLTME
      LOCATE 14, 12: PRINT "DEPARTURE TIME OF CUST.:";
      PRINT USING "##.####"; DPTME
      LOCATE 19, 8: PRINT "PRESS Y TO PROCEED FOR NEXT ENTRY"
                          & X FOR EXIT TO THE MAIN MENU"
10010 X$ = "": X$ = INKEY$
       IF X$ = "Y" OR X$ = "y" THEN GOSUB 4000: GOTO 1139
       IF X$ = "X" OR X$ = "x" THEN 40
       GOTO 10010
11000 REM CONVERSION OF TIME TO SECONDS*****************************************
      T5 = 0: T4 = 0: T6 = 0: T1 = 0: T3% = 0
      CONVTIM = TMPTM
      FLAG$ = "T"
      T1 = FIX(TMPTM): IF T1 > 24 OR T1 < 0 THEN 11100
      T4 = (TMPTM - T1) * 100
      T6 = FIX(T4)
```

```
      T5 = (T4 - T6) * 100
      T3% = T5
      IF T3% >= 100 THEN T6 = T6 + 1: T3% = 100 - T3%
      IF T3% < 0 THEN T6 = T6 - 1: T3% = T3% + 100
      IF T6 > 59 OR T3% > 59 THEN 11100
      IF T6 < 0 OR T3% < 0 THEN 11100
      TMPTM = T1 * 3600 + T6 * 60 + T3%
      RETURN
11100 LOCATE 12, 20: PRINT "ERROR IN TIME"
      FOR TT = 1 TO 500: NEXT TT
      FLAG$ = "F": RETURN
12000 REM PM MODE OF TIME CONVERTION TO 24.00 MODE ******************************
      FLAG$ = "T"
      IF TMPTM > 24 THEN FLAG$ = "F": RETURN
      IF TMPTM < 7 THEN TMPTM = TMPTM + 12
      RETURN

13000 REM TIME CONVERTION FROM SECOND TO HH,MM,SS ******************************
      T10 = 0: T12 = 0: T11 = 0: T13 = 0: T8 = 0: T9 = 0
      IF CONVTIM <= 0 THEN RETURN
      FLAG$ = "T"
      IF CONVTIM > 86400 THEN CLS : LOCATE 12, 20: PRINT "ERROR IN TIME"
      IF CONVTIM > 86400 THEN FOR TT = 1 TO 500: NEXT TT: FLAG$ = "F": RETURN
      IF CONVTIM > 0 THEN T8 = FIX(CONVTIM / 3600)
      T10 = CONVTIM - T8 * 3600
      IF T10 > 0 THEN T11 = FIX(T10 / 60)
      T12 = T10 - T11 * 60
      IF T12 > 0 THEN T13 = T12 / 10000
      T9 = T11 / 100
      CONVTIM = T8 + T9 + T13
      RETURN
16000 REM SUB FOR ACCEPTING DATE FOR STARTING OF SIMULATION ********************
      CLS : LOCATE 7, 34: PRINT " SIMULATION  PROGAM"
      LOCATE 8, 31: PRINT "************************"
      X = 10: Y = 10: Z = 5: W = 65: GOSUB 6000
      LOCATE 12, 14: INPUT "ENTER THE DATE FOR DATA ENTRIES:"; DT$
      GOSUB 17000: LOCATE 12, 46
      IF FLAG$ = "F" THEN 16005
      GOTO 16010
16005 PRINT "                ": LOCATE 23, 5
      PRINT "ENTER DATE IN (dd / mm / yy) PLEASE ": GOTO 16000
16010 PRINT DT$; "  ": FOR J = 1 TO 1000: NEXT J
      RETURN
17000 REM DATE CORRECTION AND CHECKING SUB**************************************
      J = 0: K = 1: I = 1: X2$(1) = "": X2$(2) = "": FLAG$ = "T"
      IF LEN(DT$) < 4 THEN FLAG$ = "F": RETURN
17200 X1$ = MID$(DT$, I, 1): I = I + 1
      IF X1$ = "-" OR X1$ = "/" OR X1$ = " " THEN 17300
      J = J + 1: X2$(K) = X2$(K) + X1$: IF J > 3 THEN FLAG$ = "F": RETURN
      GOTO 17200
17300 IF J = 1 THEN X2$(K) = "0" + X2$(K)
      A(K) = VAL(X2$(K))
      IF K = 1 THEN IF A(1) < 1 OR A(1) > 31 THEN FLAG$ = "F": RETURN
      IF K = 2 THEN IF A(2) < 1 OR A(2) > 12 THEN FLAG$ = "F": RETURN
      IF K < 3 THEN X2$(K) = X2$(K) + "/"
      K = K + 1: J = 0: IF K = 3 THEN GOTO 17500
      GOTO 17200
17500 X2$(3) = RIGHT$(DT$, 2)
      IF VAL(X2$(3)) > 99 OR VAL(X2$(3)) < 87 THEN FLAG$ = "F": RETURN
      DT$ = X2$(1) + X2$(2) + X2$(3): RETURN
```

```
19000 REM SUB FOR PRINTER PREPARATION*********************************************
      CLS : X = 7: Y = 15: Z = 9: W = 50: GOSUB 6000
      LOCATE 1, 5: PRINT C, DAY
      LOCATE 9, 26: PRINT "PLEASE SWITCH ON THE PRINTER"
      LOCATE 11, 22: PRINT "PLACE  80 COLUMN PAPER"
      LOCATE 13, 29: PRINT "       IN PRINTER"
      LOCATE 15, 29: PRINT "PRESS ENTER TO PROCEED"
      LOCATE 17, 28: PRINT "PRESS X TO QUIT PRINTING"
      IF SWTT1 = 0 THEN 19002
      LOCATE 1, 10: PRINT "PRODUCT NO.:";
      IF Y% > 0 AND Y% < 4 THEN PRINT Y%: GOTO 19001
      IF K < 4 AND K > 0 THEN PRINT K
19001 LOCATE 2, 10: PRINT "BRANCH :"; BRAN$; M
      LOCATE 3, 10: PRINT "ITEMNO NO.:"; : IF H > 0 AND H < 6 THEN PRINT H
      IF B < 6 AND B > 0 THEN PRINT B
      LOCATE 19, 28: PRINT "(PRESS S TO SKIP TO THE NEXT ITEM OR NEXT BRANCH)"
19002 X$ = "": X$ = INKEY$
      IF X$ = CHR$(13) OR X$ = "X" OR X$ = "x" THEN RETURN
      IF X$ = "S" OR X$ = "s" THEN RETURN
      GOTO 19002
19100 REM SUB FOR WAITING FOR COMPLITION OF PRINTING ****************************
19101 CLS : X = 8: Y = 20: Z = 7: W = 40: GOSUB 6000
19102 LOCATE 9, 35: PRINT "PLEASE WAIT"
19103 LOCATE 10, 33: PRINT "****************"
      LOCATE 13, 33: PRINT "WORK IN PROCESS"
      LOCATE 14, 31: PRINT "********************"
      RETURN
```

Simulated Class Intervals/ Limits

The tables of simulation class limits in random number generation for individual counters every day of the week for selection of arrival gap, service time and counter number are presented in this section.

These class intervals are generated and tabulated by the program, when Option 3 is selected based on the sample data collected. These tables are used by the program for random counter selection, customer service time and interarrival gap between this customer and the previous one, while the simulation is running. Arrival, call and departure times are then calculated by the program.

The procedure for calculating arrival, call and departure times of any customer in the system is as follows:-

The program generates a random number for a counter number to which an imaginary customer has to go. It checks the class interval for counter number and day of the week currently in consideration. To calculate the arrival gap, another random number is generated and compared with arrival gap class intervals. A third random number is generated and compared with class intervals of service times to select service times. Now the program calculates arrival time, call time and departure time of the customer as well as customer waiting time and counter idle time.

The steps in calculation are as follows:-

Arrival time = Previous Arrival time + Arrival gap

Call time = Previous Departure time (if arrival time is less than previous departure time)

OR ELSE Call time = Arrival time

Departure time = Call time + Service time

Waiting time = Departure time - Arrival time

Counter Idle time = Arrival time - Previous departure time

The format of the limit tables are shown below:-

Col 1	Col 2	Col 3	Col4	Col5	Col 6
Total No. of Arrivals /DayofWk	a) Arr. Gap b) Ser Time c) Count. No.	Average No. of arr/day of week	Cum. Ave arr	Prob. of arr	Random No. of limit

The first column represents the total number of arrivals on a particular day of the week for all weeks for which sample data is collected. In case of this study sample data was collected for only one week.

eg. For a 3 week sample data, there will be 3 Mondays, Tuesdays,etc. Column 1 represents the total of the 3 Mondays.

Column 2 is available in three types of tables: Arrival Gap, Service Time and Counter Number. In case of Arrival Gap Tables this column contains arrival gap in minutes. In Service time Tables this column holds service time in minutes. In Counter Number Tables this column holds counter number.

Column 3 of these limit tables has average number of arrivals per day, i.e. total number of arrivals in Column 1 divided by the number of weeks for which data is collected.

Column 4 consists of information on cumulative of average of number of arrivals per day i.e. cumulative of Column 3.

Column 5 represents the probability of arrival.

Column 6 contains class intervals with respect to the probabilities shown in Column 5.

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR MON-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
74	1 MIN.	74	74	0.500	0 - 500
36	2 MIN.	36	110	0.743	501 - 743
10	3 MIN.	10	120	0.811	744 - 811
11	4 MIN.	11	131	0.885	812 - 885
2	6 MIN.	2	133	0.899	886 - 899
3	7 MIN.	3	136	0.919	900 - 919
3	8 MIN.	3	139	0.939	920 - 939
2	9 MIN.	2	141	0.953	940 - 953
2	10 MIN.	2	143	0.966	954 - 966
1	12 MIN.	1	144	0.973	967 - 973
1	13 MIN.	1	145	0.980	974 - 980
1	15 MIN.	1	146	0.986	981 - 986
1	16 MIN.	1	147	0.993	987 - 993
1	31 MIN.	1	148	1.000	994 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR TUE-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
60	1 MIN.	60	60	0.462	0 - 462
28	2 MIN.	28	88	0.677	463 - 677
12	3 MIN.	12	100	0.769	678 - 769
6	4 MIN.	6	106	0.815	770 - 815
4	5 MIN.	4	110	0.846	816 - 846
4	6 MIN.	4	114	0.877	847 - 877
2	7 MIN.	2	116	0.892	878 - 892
4	8 MIN.	4	120	0.923	893 - 923
2	9 MIN.	2	122	0.938	924 - 938
3	10 MIN.	3	125	0.962	939 - 962
1	11 MIN.	1	126	0.969	963 - 969
2	12 MIN.	2	128	0.985	970 - 985
1	14 MIN.	1	129	0.992	986 - 992
1	45 MIN.	1	130	1.000	993 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR WED-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
63	1 MIN.	63	63	0.457	0 - 457
38	2 MIN.	38	101	0.732	458 - 732
12	3 MIN.	12	113	0.819	733 - 819
7	4 MIN.	7	120	0.870	820 - 870
5	5 MIN.	5	125	0.906	871 - 906
4	6 MIN.	4	129	0.935	907 - 935
4	7 MIN.	4	133	0.964	936 - 964
3	8 MIN.	3	136	0.986	965 - 986
1	9 MIN.	1	137	0.993	987 - 993
1	45 MIN.	1	138	1.000	994 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR THU-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
78	1 MIN.	78	78	0.506	0 - 506
30	2 MIN.	30	108	0.701	507 - 701
15	3 MIN.	15	123	0.799	702 - 799
8	4 MIN.	8	131	0.851	800 - 851
7	5 MIN.	7	138	0.896	852 - 896
5	6 MIN.	5	143	0.929	897 - 929
2	7 MIN.	2	145	0.942	930 - 942
2	8 MIN.	2	147	0.955	943 - 955
3	9 MIN.	3	150	0.974	956 - 974
1	11 MIN.	1	151	0.981	975 - 981
1	15 MIN.	1	152	0.987	982 - 987
1	16 MIN.	1	153	0.994	988 - 994
1	45 MIN.	1	154	1.000	995 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR FRI-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
62	1 MIN.	62	62	0.470	0 - 470
28	2 MIN.	28	90	0.682	471 - 682
8	3 MIN.	8	98	0.742	683 - 742
9	4 MIN.	9	107	0.811	743 - 811
4	5 MIN.	4	111	0.841	812 - 841
6	6 MIN.	6	117	0.886	842 - 886
3	7 MIN.	3	120	0.909	887 - 909
2	8 MIN.	2	122	0.924	910 - 924
2	10 MIN.	2	124	0.939	925 - 939
2	11 MIN.	2	126	0.955	940 - 955
3	12 MIN.	3	129	0.977	956 - 977
1	17 MIN.	1	130	0.985	978 - 985
1	28 MIN.	1	131	0.992	986 - 992
1	44 MIN.	1	132	1.000	993 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR SAT-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
98	1 MIN.	98	98	0.580	0 - 580
32	2 MIN.	32	130	0.769	581 - 769
13	3 MIN.	13	143	0.846	770 - 846
8	4 MIN.	8	151	0.893	847 - 893
4	5 MIN.	4	155	0.917	894 - 917
4	6 MIN.	4	159	0.941	918 - 941
2	7 MIN.	2	161	0.953	942 - 953
1	8 MIN.	1	162	0.959	954 - 959
1	9 MIN.	1	163	0.964	960 - 964
1	10 MIN.	1	164	0.970	965 - 970
3	11 MIN.	3	167	0.988	971 - 988
1	13 MIN.	1	168	0.994	989 - 994
1	16 MIN.	1	169	1.000	995 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR SUN-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
43	1 MIN.	43	43	0.394	0 - 394
26	2 MIN.	26	69	0.633	395 - 633
7	3 MIN.	7	76	0.697	634 - 697
4	4 MIN.	4	80	0.734	698 - 734
8	5 MIN.	8	88	0.807	735 - 807
7	6 MIN.	7	95	0.872	808 - 872
1	7 MIN.	1	96	0.881	873 - 881
1	8 MIN.	1	97	0.890	882 - 890
1	9 MIN.	1	98	0.899	891 - 899
2	11 MIN.	2	100	0.917	900 - 917
4	12 MIN.	4	104	0.954	918 - 954
2	13 MIN.	2	106	0.972	955 - 972
1	15 MIN.	1	107	0.982	973 - 982
1	22 MIN.	1	108	0.991	983 - 991
1	45 MIN.	1	109	1.000	992 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR MON-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
1	1 MIN.	1	1	0.040	0 - 40
3	2 MIN.	3	4	0.160	41 - 160
1	3 MIN.	1	5	0.200	161 - 200
1	4 MIN.	1	6	0.240	201 - 240
2	5 MIN.	2	8	0.320	241 - 320
1	7 MIN.	1	9	0.360	321 - 360
2	11 MIN.	2	11	0.440	361 - 440
1	15 MIN.	1	12	0.480	441 - 480
1	21 MIN.	1	13	0.520	481 - 520
1	23 MIN.	1	14	0.560	521 - 560
1	24 MIN.	1	15	0.600	561 - 600
2	25 MIN.	2	17	0.680	601 - 680
2	26 MIN.	2	19	0.760	681 - 760
1	29 MIN.	1	20	0.800	761 - 800
1	39 MIN.	1	21	0.840	801 - 840
1	40 MIN.	1	22	0.880	841 - 880
3	45 MIN.	3	25	1.000	881 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR TUE-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
3	1 MIN.	3	3	0.111	0 - 111
2	4 MIN.	2	5	0.185	112 - 185
1	6 MIN.	1	6	0.222	186 - 222
3	7 MIN.	3	9	0.333	223 - 333
2	9 MIN.	2	11	0.407	334 - 407
3	10 MIN.	3	14	0.519	408 - 519
1	11 MIN.	1	15	0.556	520 - 556
1	21 MIN.	1	16	0.593	557 - 593
1	22 MIN.	1	17	0.630	594 - 630
1	24 MIN.	1	18	0.667	631 - 667
3	25 MIN.	3	21	0.778	668 - 778
1	27 MIN.	1	22	0.815	779 - 815
1	29 MIN.	1	23	0.852	816 - 852
1	30 MIN.	1	24	0.889	853 - 889
1	31 MIN.	1	25	0.926	890 - 926
1	32 MIN.	1	26	0.963	927 - 963
1	36 MIN.	1	27	1.000	964 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR WED-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.071	0 - 71
1	2 MIN.	1	3	0.107	72 - 107
1	4 MIN.	1	4	0.143	108 - 143
1	5 MIN.	1	5	0.179	144 - 179
2	6 MIN.	2	7	0.250	180 - 250
2	7 MIN.	2	9	0.321	251 - 321
2	8 MIN.	2	11	0.393	322 - 393
1	10 MIN.	1	12	0.429	394 - 429
2	11 MIN.	2	14	0.500	430 - 500
1	12 MIN.	1	15	0.536	501 - 536
1	14 MIN.	1	16	0.571	537 - 571
1	15 MIN.	1	17	0.607	572 - 607
1	21 MIN.	1	18	0.643	608 - 643
2	24 MIN.	2	20	0.714	644 - 714
1	27 MIN.	1	21	0.750	715 - 750
1	30 MIN.	1	22	0.786	751 - 786
1	31 MIN.	1	23	0.821	787 - 821
1	33 MIN.	1	24	0.857	822 - 857
1	34 MIN.	1	25	0.893	858 - 893
1	39 MIN.	1	26	0.929	894 - 929
1	41 MIN.	1	27	0.964	930 - 964
1	45 MIN.	1	28	1.000	965 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR THU-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
3	1 MIN.	3	3	0.136	0 - 136
3	2 MIN.	3	6	0.273	137 - 273
1	3 MIN.	1	7	0.318	274 - 318
1	4 MIN.	1	8	0.364	319 - 364
1	5 MIN.	1	9	0.409	365 - 409
2	7 MIN.	2	11	0.500	410 - 500
1	10 MIN.	1	12	0.545	501 - 545
1	16 MIN.	1	13	0.591	546 - 591
1	18 MIN.	1	14	0.636	592 - 636
1	35 MIN.	1	15	0.682	637 - 682
1	39 MIN.	1	16	0.727	683 - 727
3	40 MIN.	3	19	0.864	728 - 864
1	44 MIN.	1	20	0.909	865 - 909
2	45 MIN.	2	22	1.000	910 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR FRI-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.125	0 - 125
1	7 MIN.	1	3	0.188	126 - 188
2	11 MIN.	2	5	0.313	189 - 312
1	12 MIN.	1	6	0.375	313 - 375
1	27 MIN.	1	7	0.438	376 - 438
1	30 MIN.	1	8	0.500	439 - 500
1	34 MIN.	1	9	0.563	501 - 562
1	37 MIN.	1	10	0.625	563 - 625
1	41 MIN.	1	11	0.688	626 - 688
5	45 MIN.	5	16	1.000	689 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR SAT-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.047	0 - 47
4	2 MIN.	4	6	0.140	48 - 140
3	3 MIN.	3	9	0.209	141 - 209
5	5 MIN.	5	14	0.326	210 - 326
2	6 MIN.	2	16	0.372	327 - 372
1	7 MIN.	1	17	0.395	373 - 395
2	8 MIN.	2	19	0.442	396 - 442
4	9 MIN.	4	23	0.535	443 - 535
2	10 MIN.	2	25	0.581	536 - 581
2	11 MIN.	2	27	0.628	582 - 628
1	12 MIN.	1	28	0.651	629 - 651
1	13 MIN.	1	29	0.674	652 - 674
1	14 MIN.	1	30	0.698	675 - 698
1	15 MIN.	1	31	0.721	699 - 721
1	16 MIN.	1	32	0.744	722 - 744
3	17 MIN.	3	35	0.814	745 - 814
2	24 MIN.	2	37	0.860	815 - 860
1	25 MIN.	1	38	0.884	861 - 884
1	26 MIN.	1	39	0.907	885 - 907
1	28 MIN.	1	40	0.930	908 - 930
1	29 MIN.	1	41	0.953	931 - 953
1	30 MIN.	1	42	0.977	954 - 977
1	34 MIN.	1	43	1.000	978 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR SUN-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
4	1 MIN.	4	4	0.160	0 - 160
1	2 MIN.	1	5	0.200	161 - 200
2	3 MIN.	2	7	0.280	201 - 280
2	5 MIN.	2	9	0.360	281 - 360
1	9 MIN.	1	10	0.400	361 - 400
1	12 MIN.	1	11	0.440	401 - 440
1	15 MIN.	1	12	0.480	441 - 480
1	16 MIN.	1	13	0.520	481 - 520
2	18 MIN.	2	15	0.600	521 - 600
1	21 MIN.	1	16	0.640	601 - 640
1	23 MIN.	1	17	0.680	641 - 680
1	27 MIN.	1	18	0.720	681 - 720
1	31 MIN.	1	19	0.760	721 - 760
1	33 MIN.	1	20	0.800	761 - 800
1	35 MIN.	1	21	0.840	801 - 840
1	42 MIN.	1	22	0.880	841 - 880
1	43 MIN.	1	23	0.920	881 - 920
1	44 MIN.	1	24	0.960	921 - 960
1	45 MIN.	1	25	1.000	961 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR MON-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
19	1 MIN.	19	19	0.213	0 - 213
9	2 MIN.	9	28	0.315	214 - 315
12	3 MIN.	12	40	0.449	316 - 449
6	4 MIN.	6	46	0.517	450 - 517
7	5 MIN.	7	53	0.596	518 - 596
5	6 MIN.	5	58	0.652	597 - 652
6	7 MIN.	6	64	0.719	653 - 719
5	8 MIN.	5	69	0.775	720 - 775
2	9 MIN.	2	71	0.798	776 - 798
1	10 MIN.	1	72	0.809	799 - 809
4	11 MIN.	4	76	0.854	810 - 854
5	12 MIN.	5	81	0.910	855 - 910
2	14 MIN.	2	83	0.933	911 - 933
2	15 MIN.	2	85	0.955	934 - 955
1	16 MIN.	1	86	0.966	956 - 966
1	18 MIN.	1	87	0.978	967 - 978
1	19 MIN.	1	88	0.989	979 - 989
1	21 MIN.	1	89	1.000	990 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR TUE-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
16	1 MIN.	16	16	0.205	0 - 205
9	2 MIN.	9	25	0.321	206 - 321
10	3 MIN.	10	35	0.449	322 - 449
8	4 MIN.	8	43	0.551	450 - 551
2	5 MIN.	2	45	0.577	552 - 577
2	6 MIN.	2	47	0.603	578 - 603
6	7 MIN.	6	53	0.679	604 - 679
5	8 MIN.	5	58	0.744	680 - 744
3	9 MIN.	3	61	0.782	745 - 782
3	10 MIN.	3	64	0.821	783 - 821
2	11 MIN.	2	66	0.846	822 - 846
1	12 MIN.	1	67	0.859	847 - 859
1	13 MIN.	1	68	0.872	860 - 872
1	15 MIN.	1	69	0.885	873 - 885
2	16 MIN.	2	71	0.910	886 - 910
2	18 MIN.	2	73	0.936	911 - 936
1	20 MIN.	1	74	0.949	937 - 949
2	21 MIN.	2	76	0.974	950 - 974
1	24 MIN.	1	77	0.987	975 - 987
1	28 MIN.	1	78	1.000	988 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR WED-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
18	1 MIN.	18	18	0.254	0 - 254
9	2 MIN.	9	27	0.380	255 - 380
6	3 MIN.	6	33	0.465	381 - 465
5	4 MIN.	5	38	0.535	466 - 535
4	5 MIN.	4	42	0.592	536 - 592
5	6 MIN.	5	47	0.662	593 - 662
3	7 MIN.	3	50	0.704	663 - 704
2	8 MIN.	2	52	0.732	705 - 732
2	9 MIN.	2	54	0.761	733 - 761
4	10 MIN.	4	58	0.817	762 - 817
2	11 MIN.	2	60	0.845	818 - 845
1	12 MIN.	1	61	0.859	846 - 859
1	13 MIN.	1	62	0.873	860 - 873
1	14 MIN.	1	63	0.887	874 - 887
2	16 MIN.	2	65	0.915	888 - 915
1	17 MIN.	1	66	0.930	916 - 930
2	19 MIN.	2	68	0.958	931 - 958
1	21 MIN.	1	69	0.972	959 - 972
1	24 MIN.	1	70	0.986	973 - 986
1	26 MIN.	1	71	1.000	987 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR THU-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
18	1 MIN.	18	18	0.261	0 - 261
14	2 MIN.	14	32	0.464	262 - 464
5	3 MIN.	5	37	0.536	465 - 536
3	4 MIN.	3	40	0.580	537 - 580
3	5 MIN.	3	43	0.623	581 - 623
4	6 MIN.	4	47	0.681	624 - 681
5	7 MIN.	5	52	0.754	682 - 754
4	8 MIN.	4	56	0.812	755 - 812
4	9 MIN.	4	60	0.870	813 - 870
1	12 MIN.	1	61	0.884	871 - 884
1	13 MIN.	1	62	0.899	885 - 899
2	14 MIN.	2	64	0.928	900 - 928
1	15 MIN.	1	65	0.942	929 - 942
1	17 MIN.	1	66	0.957	943 - 957
1	20 MIN.	1	67	0.971	958 - 971
1	23 MIN.	1	68	0.986	972 - 986
1	27 MIN.	1	69	1.000	987 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR FRI-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
38	1 MIN.	38	38	0.432	0 - 432
13	2 MIN.	13	51	0.580	433 - 580
4	3 MIN.	4	55	0.625	581 - 625
5	4 MIN.	5	60	0.682	626 - 682
4	5 MIN.	4	64	0.727	683 - 727
3	6 MIN.	3	67	0.761	728 - 761
4	7 MIN.	4	71	0.807	762 - 807
5	8 MIN.	5	76	0.864	808 - 864
2	9 MIN.	2	78	0.886	865 - 886
4	11 MIN.	4	82	0.932	887 - 932
2	12 MIN.	2	84	0.955	933 - 955
2	14 MIN.	2	86	0.977	956 - 977
1	18 MIN.	1	87	0.989	978 - 989
1	20 MIN.	1	88	1.000	990 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR SAT-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
24	1 MIN.	24	24	0.293	0 - 293
8	2 MIN.	8	32	0.390	294 - 390
10	3 MIN.	10	42	0.512	391 - 512
6	4 MIN.	6	48	0.585	513 - 585
6	5 MIN.	6	54	0.659	586 - 659
7	6 MIN.	7	61	0.744	660 - 744
3	7 MIN.	3	64	0.780	745 - 780
1	8 MIN.	1	65	0.793	781 - 793
1	9 MIN.	1	66	0.805	794 - 805
3	10 MIN.	3	69	0.841	806 - 841
3	11 MIN.	3	72	0.878	842 - 878
2	12 MIN.	2	74	0.902	879 - 902
1	13 MIN.	1	75	0.915	903 - 915
2	14 MIN.	2	77	0.939	916 - 939
1	15 MIN.	1	78	0.951	940 - 951
1	18 MIN.	1	79	0.963	952 - 963
1	21 MIN.	1	80	0.976	964 - 976
1	30 MIN.	1	81	0.988	977 - 988
1	45 MIN.	1	82	1.000	989 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR ARR.GAP TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR SUN-DAY

TOT.NO.OF ARRIVALS	ARR.GAP TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
20	1 MIN.	20	20	0.313	0 - 312
8	2 MIN.	8	28	0.438	313 - 438
5	3 MIN.	5	33	0.516	439 - 516
3	4 MIN.	3	36	0.563	517 - 562
4	5 MIN.	4	40	0.625	563 - 625
1	6 MIN.	1	41	0.641	626 - 641
4	7 MIN.	4	45	0.703	642 - 703
2	8 MIN.	2	47	0.734	704 - 734
2	9 MIN.	2	49	0.766	735 - 766
3	11 MIN.	3	52	0.813	767 - 812
1	12 MIN.	1	53	0.828	813 - 828
3	13 MIN.	3	56	0.875	829 - 875
1	14 MIN.	1	57	0.891	876 - 891
1	15 MIN.	1	58	0.906	892 - 906
1	18 MIN.	1	59	0.922	907 - 922
1	26 MIN.	1	60	0.938	923 - 938
1	27 MIN.	1	61	0.953	939 - 953
1	31 MIN.	1	62	0.969	954 - 969
1	40 MIN.	1	63	0.984	970 - 984
1	45 MIN.	1	64	1.000	985 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR MON-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
30	1 MIN.	30	30	0.203	0 - 203
39	2 MIN.	39	69	0.466	204 - 466
26	3 MIN.	26	95	0.642	467 - 642
19	4 MIN.	19	114	0.770	643 - 770
13	5 MIN.	13	127	0.858	771 - 858
6	6 MIN.	6	133	0.899	859 - 899
8	7 MIN.	8	141	0.953	900 - 953
1	8 MIN.	1	142	0.959	954 - 959
2	9 MIN.	2	144	0.973	960 - 973
3	11 MIN.	3	147	0.993	974 - 993
1	13 MIN.	1	148	1.000	994 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR TUE-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
30	1 MIN.	30	30	0.231	0 - 231
26	2 MIN.	26	56	0.431	232 - 431
21	3 MIN.	21	77	0.592	432 - 592
18	4 MIN.	18	95	0.731	593 - 731
6	5 MIN.	6	101	0.777	732 - 777
5	6 MIN.	5	106	0.815	778 - 815
10	7 MIN.	10	116	0.892	816 - 892
5	8 MIN.	5	121	0.931	893 - 931
4	9 MIN.	4	125	0.962	932 - 962
3	11 MIN.	3	128	0.985	963 - 985
1	12 MIN.	1	129	0.992	986 - 992
1	13 MIN.	1	130	1.000	993 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR WED-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
29	1 MIN.	29	29	0.210	0 - 210
36	2 MIN.	36	65	0.471	211 - 471
25	3 MIN.	25	90	0.652	472 - 652
13	4 MIN.	13	103	0.746	653 - 746
13	5 MIN.	13	116	0.841	747 - 841
5	6 MIN.	5	121	0.877	842 - 877
4	7 MIN.	4	125	0.906	878 - 906
3	8 MIN.	3	128	0.928	907 - 928
3	9 MIN.	3	131	0.949	929 - 949
1	10 MIN.	1	132	0.957	950 - 957
3	11 MIN.	3	135	0.978	958 - 978
1	12 MIN.	1	136	0.986	979 - 986
1	14 MIN.	1	137	0.993	987 - 993
1	17 MIN.	1	138	1.000	994 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR THU-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
43	1 MIN.	43	43	0.279	0 - 279
45	2 MIN.	45	88	0.571	280 - 571
18	3 MIN.	18	106	0.688	572 - 688
20	4 MIN.	20	126	0.818	689 - 818
8	5 MIN.	8	134	0.870	819 - 870
4	6 MIN.	4	138	0.896	871 - 896
5	7 MIN.	5	143	0.929	897 - 929
4	8 MIN.	4	147	0.955	930 - 955
3	10 MIN.	3	150	0.974	956 - 974
2	11 MIN.	2	152	0.987	975 - 987
1	12 MIN.	1	153	0.994	988 - 994
1	20 MIN.	1	154	1.000	995 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR FRI-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
29	1 MIN.	29	29	0.220	0 - 220
34	2 MIN.	34	63	0.477	221 - 477
19	3 MIN.	19	82	0.621	478 - 621
19	4 MIN.	19	101	0.765	622 - 765
8	5 MIN.	8	109	0.826	766 - 826
2	6 MIN.	2	111	0.841	827 - 841
6	7 MIN.	6	117	0.886	842 - 886
2	8 MIN.	2	119	0.902	887 - 902
3	9 MIN.	3	122	0.924	903 - 924
1	10 MIN.	1	123	0.932	925 - 932
4	11 MIN.	4	127	0.962	933 - 962
3	12 MIN.	3	130	0.985	963 - 985
2	13 MIN.	2	132	1.000	986 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR SAT-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
50	1 MIN.	50	50	0.296	0 - 296
46	2 MIN.	46	96	0.568	297 - 568
25	3 MIN.	25	121	0.716	569 - 716
18	4 MIN.	18	139	0.822	717 - 822
7	5 MIN.	7	146	0.864	823 - 864
10	6 MIN.	10	156	0.923	865 - 923
5	7 MIN.	5	161	0.953	924 - 953
3	8 MIN.	3	164	0.970	954 - 970
3	9 MIN.	3	167	0.988	971 - 988
1	10 MIN.	1	168	0.994	989 - 994
1	11 MIN.	1	169	1.000	995 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 1 FOR SUN-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
19	1 MIN.	19	19	0.174	0 - 174
28	2 MIN.	28	47	0.431	175 - 431
17	3 MIN.	17	64	0.587	432 - 587
13	4 MIN.	13	77	0.706	588 - 706
7	5 MIN.	7	84	0.771	707 - 771
6	6 MIN.	6	90	0.826	772 - 826
5	7 MIN.	5	95	0.872	827 - 872
3	8 MIN.	3	98	0.899	873 - 899
4	9 MIN.	4	102	0.936	900 - 936
2	10 MIN.	2	104	0.954	937 - 954
1	13 MIN.	1	105	0.963	955 - 963
1	14 MIN.	1	106	0.972	964 - 972
2	15 MIN.	2	108	0.991	973 - 991
1	19 MIN.	1	109	1.000	992 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR MON-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.080	0 - 80
3	2 MIN.	3	5	0.200	81 - 200
5	3 MIN.	5	10	0.400	201 - 400
3	4 MIN.	3	13	0.520	401 - 520
8	5 MIN.	8	21	0.840	521 - 840
1	7 MIN.	1	22	0.880	841 - 880
1	8 MIN.	1	23	0.920	881 - 920
1	9 MIN.	1	24	0.960	921 - 960
1	10 MIN.	1	25	1.000	961 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR TUE-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.074	0 - 74
2	2 MIN.	2	4	0.148	75 - 148
3	3 MIN.	3	7	0.259	149 - 259
4	4 MIN.	4	11	0.407	260 - 407
4	5 MIN.	4	15	0.556	408 - 556
2	6 MIN.	2	17	0.630	557 - 630
1	7 MIN.	1	18	0.667	631 - 667
3	8 MIN.	3	21	0.778	668 - 778
1	9 MIN.	1	22	0.815	779 - 815
1	10 MIN.	1	23	0.852	816 - 852
3	11 MIN.	3	26	0.963	853 - 963
1	17 MIN.	1	27	1.000	964 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR WED-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
2	1 MIN.	2	2	0.071	0 - 71
6	2 MIN.	6	8	0.286	72 - 286
6	3 MIN.	6	14	0.500	287 - 500
3	4 MIN.	3	17	0.607	501 - 607
4	5 MIN.	4	21	0.750	608 - 750
1	6 MIN.	1	22	0.786	751 - 786
2	7 MIN.	2	24	0.857	787 - 857
1	8 MIN.	1	25	0.893	858 - 893
1	9 MIN.	1	26	0.929	894 - 929
1	10 MIN.	1	27	0.964	930 - 964
1	12 MIN.	1	28	1.000	965 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR THU-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
1	1 MIN.	1	1	0.045	0 - 45
6	2 MIN.	6	7	0.318	46 - 318
6	3 MIN.	6	13	0.591	319 - 591
4	4 MIN.	4	17	0.773	592 - 773
4	5 MIN.	4	21	0.955	774 - 955
1	6 MIN.	1	22	1.000	956 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR FRI-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
4	2 MIN.	4	4	0.250	0 - 250
4	3 MIN.	4	8	0.500	251 - 500
4	4 MIN.	4	12	0.750	501 - 750
2	5 MIN.	2	14	0.875	751 - 875
1	6 MIN.	1	15	0.938	876 - 938
1	9 MIN.	1	16	1.000	939 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR SAT-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
4	1 MIN.	4	4	0.093	0 - 93
8	2 MIN.	8	12	0.279	94 - 279
9	3 MIN.	9	21	0.488	280 - 488
14	4 MIN.	14	35	0.814	489 - 814
2	5 MIN.	2	37	0.860	815 - 860
2	6 MIN.	2	39	0.907	861 - 907
2	7 MIN.	2	41	0.953	908 - 953
1	8 MIN.	1	42	0.977	954 - 977
1	14 MIN.	1	43	1.000	978 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 2 FOR SUN-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
3	1 MIN.	3	3	0.120	0 - 120
5	2 MIN.	5	8	0.320	121 - 320
7	3 MIN.	7	15	0.600	321 - 600
4	4 MIN.	4	19	0.760	601 - 760
1	5 MIN.	1	20	0.800	761 - 800
3	6 MIN.	3	23	0.920	801 - 920
1	7 MIN.	1	24	0.960	921 - 960
1	15 MIN.	1	25	1.000	961 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR MON-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
21	1 MIN.	21	21	0.236	0 - 236
11	2 MIN.	11	32	0.360	237 - 360
14	3 MIN.	14	46	0.517	361 - 517
8	4 MIN.	8	54	0.607	518 - 607
8	5 MIN.	8	62	0.697	608 - 697
3	6 MIN.	3	65	0.730	698 - 730
2	7 MIN.	2	67	0.753	731 - 753
4	8 MIN.	4	71	0.798	754 - 798
1	9 MIN.	1	72	0.809	799 - 809
3	11 MIN.	3	75	0.843	810 - 843
2	12 MIN.	2	77	0.865	844 - 865
3	13 MIN.	3	80	0.899	866 - 899
2	14 MIN.	2	82	0.921	900 - 921
4	15 MIN.	4	86	0.966	922 - 966
2	19 MIN.	2	88	0.989	967 - 989
1	26 MIN.	1	89	1.000	990 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR TUE-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
13	1 MIN.	13	13	0.167	0 - 167
9	2 MIN.	9	22	0.282	168 - 282
9	3 MIN.	9	31	0.397	283 - 397
9	4 MIN.	9	40	0.513	398 - 513
8	5 MIN.	8	48	0.615	514 - 615
6	6 MIN.	6	54	0.692	616 - 692
6	7 MIN.	6	60	0.769	693 - 769
4	8 MIN.	4	64	0.821	770 - 821
2	9 MIN.	2	66	0.846	822 - 846
1	10 MIN.	1	67	0.859	847 - 859
2	12 MIN.	2	69	0.885	860 - 885
4	13 MIN.	4	73	0.936	886 - 936
4	14 MIN.	4	77	0.987	937 - 987
1	19 MIN.	1	78	1.000	988 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR WED-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
13	1 MIN.	13	13	0.183	0 - 183
7	2 MIN.	7	20	0.282	184 - 282
5	3 MIN.	5	25	0.352	283 - 352
5	4 MIN.	5	30	0.423	353 - 423
8	5 MIN.	8	38	0.535	424 - 535
4	6 MIN.	4	42	0.592	536 - 592
6	7 MIN.	6	48	0.676	593 - 676
5	8 MIN.	5	53	0.746	677 - 746
2	9 MIN.	2	55	0.775	747 - 775
5	10 MIN.	5	60	0.845	776 - 845
2	11 MIN.	2	62	0.873	846 - 873
1	12 MIN.	1	63	0.887	874 - 887
2	14 MIN.	2	65	0.915	888 - 915
1	16 MIN.	1	66	0.930	916 - 930
3	18 MIN.	3	69	0.972	931 - 972
1	20 MIN.	1	70	0.986	973 - 986
1	21 MIN.	1	71	1.000	987 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR THU-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
7	1 MIN.	7	7	0.101	0 - 101
8	2 MIN.	8	15	0.217	102 - 217
13	3 MIN.	13	28	0.406	218 - 406
5	4 MIN.	5	33	0.478	407 - 478
3	5 MIN.	3	36	0.522	479 - 522
4	6 MIN.	4	40	0.580	523 - 580
3	7 MIN.	3	43	0.623	581 - 623
7	8 MIN.	7	50	0.725	624 - 725
4	9 MIN.	4	54	0.783	726 - 783
5	10 MIN.	5	59	0.855	784 - 855
3	11 MIN.	3	62	0.899	856 - 899
1	13 MIN.	1	63	0.913	900 - 913
1	14 MIN.	1	64	0.928	914 - 928
2	15 MIN.	2	66	0.957	929 - 957
1	19 MIN.	1	67	0.971	958 - 971
2	21 MIN.	2	69	1.000	972 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR FRI-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
13	1 MIN.	13	13	0.148	0 - 148
14	2 MIN.	14	27	0.307	149 - 307
9	3 MIN.	9	36	0.409	308 - 409
10	4 MIN.	10	46	0.523	410 - 523
10	5 MIN.	10	56	0.636	524 - 636
5	6 MIN.	5	61	0.693	637 - 693
10	7 MIN.	10	71	0.807	694 - 807
4	8 MIN.	4	75	0.852	808 - 852
2	9 MIN.	2	77	0.875	853 - 875
3	10 MIN.	3	80	0.909	876 - 909
3	12 MIN.	3	83	0.943	910 - 943
1	13 MIN.	1	84	0.955	944 - 955
1	14 MIN.	1	85	0.966	956 - 966
2	16 MIN.	2	87	0.989	967 - 989
1	17 MIN.	1	88	1.000	990 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR SAT-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
9	1 MIN.	9	9	0.110	0 - 110
19	2 MIN.	19	28	0.341	111 - 341
17	3 MIN.	17	45	0.549	342 - 549
11	4 MIN.	11	56	0.683	550 - 683
9	5 MIN.	9	65	0.793	684 - 793
4	6 MIN.	4	69	0.841	794 - 841
6	7 MIN.	6	75	0.915	842 - 915
3	8 MIN.	3	78	0.951	916 - 951
2	9 MIN.	2	80	0.976	952 - 976
1	10 MIN.	1	81	0.988	977 - 988
1	13 MIN.	1	82	1.000	989 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS FOR SERVICE TIME FOR GENERATION OF RANDOM NO.
FOR COUNTER NO.: 3 FOR SUN-DAY

TOT.NO.OF ARRIVALS	SERVICE TIME	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
10	1 MIN.	10	10	0.156	0 - 156
3	2 MIN.	3	13	0.203	157 - 203
8	3 MIN.	8	21	0.328	204 - 328
9	4 MIN.	9	30	0.469	329 - 469
8	5 MIN.	8	38	0.594	470 - 594
4	6 MIN.	4	42	0.656	595 - 656
2	7 MIN.	2	44	0.688	657 - 688
5	8 MIN.	5	49	0.766	689 - 766
3	9 MIN.	3	52	0.813	767 - 812
2	10 MIN.	2	54	0.844	813 - 844
2	11 MIN.	2	56	0.875	845 - 875
2	12 MIN.	2	58	0.906	876 - 906
2	13 MIN.	2	60	0.938	907 - 938
1	15 MIN.	1	61	0.953	939 - 953
1	18 MIN.	1	62	0.969	954 - 969
1	20 MIN.	1	63	0.984	970 - 984
1	21 MIN.	1	64	1.000	985 - 1000

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR MON-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
148	1	148	148	0.56	0 - 56
25	2	25	173	0.66	57 - 66
89	3	89	262	1.00	67 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR TUE-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
130	1	130	130	0.55	0 - 55
27	2	27	157	0.67	56 - 67
78	3	78	235	1.00	68 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR WED-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
138	1	138	138	0.58	0 - 58
28	2	28	166	0.70	59 - 70
71	3	71	237	1.00	71 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR THU-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
154	1	154	154	0.63	0 - 63
22	2	22	176	0.72	64 - 72
69	3	69	245	1.00	73 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR FRI-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
132	1	132	132	0.56	0 - 56
16	2	16	148	0.63	57 - 63
88	3	88	236	1.00	64 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR SAT-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
169	1	169	169	0.57	0 - 57
43	2	43	212	0.72	58 - 72
82	3	82	294	1.00	73 - 100

SIMULATION OF QUEUING SYSTEM
CALCULATION OF LIMITS OF SERVICE COUNTER FOR GENERATION OF RANDOM NO.
FOR SUN-DAY

TOT.NO.OF ARRIVALS	SERVICE COUNTER	AV.NO.OF ARR./DAY	CUMULATIVE ARRIVALS	PROB. OF ARR.	RAND.NO. LIMIT
109	1	109	109	0.55	0 - 55
25	2	25	134	0.68	56 - 68
64	3	64	198	1.00	69 - 100

SIMULATED DATA LIST OF 06/09/90
********** PAGE: 1
COUNTER NO. 1

CUST. NO.	ARRIV. TIME	CALL TIME	DEPTU TIME	ARRIV. GAP	SERV. TIME	WATING TIME	COUNT. IDL.TIME
1	8.0100	8.3000	8.3100	0.0100	0.0100	0.3000	0.0000
2	8.0200	8.3100	8.3500	0.0100	0.0400	0.3300	0.0000
3	8.0400	8.3500	8.3600	0.0200	0.0100	0.3200	0.0000
4	8.0600	8.3600	8.4000	0.0200	0.0400	0.3400	0.0000
5	8.1300	8.4000	8.4400	0.0700	0.0400	0.3100	0.0000
6	8.1500	8.4400	8.4700	0.0200	0.0300	0.3200	0.0000
7	8.1700	8.4700	8.5200	0.0200	0.0500	0.3500	0.0000
8	8.1900	8.5200	8.5300	0.0200	0.0100	0.3400	0.0000
9	8.2800	8.5300	8.5500	0.0900	0.0200	0.2700	0.0000
10	8.3200	8.5500	9.0000	0.0400	0.0500	0.2800	0.0000
11	8.3300	9.0000	9.0200	0.0100	0.0200	0.2900	0.0000
12	8.3400	9.0200	9.0600	0.0100	0.0400	0.3200	0.0000
13	8.3500	9.0600	9.0900	0.0100	0.0300	0.3400	0.0000
14	8.3600	9.0900	9.1000	0.0100	0.0100	0.3400	0.0000
15	8.3700	9.1000	9.1300	0.0100	0.0300	0.3600	0.0000
16	8.4000	9.1300	9.1800	0.0300	0.0500	0.3800	0.0000
17	8.4200	9.1800	9.2200	0.0200	0.0400	0.4000	0.0000
18	8.4400	9.2200	9.2400	0.0200	0.0200	0.4000	0.0000
19	8.4500	9.2400	9.2900	0.0100	0.0500	0.4400	0.0000
20	8.4700	9.2900	9.3100	0.0200	0.0200	0.4400	0.0000
21	8.5100	9.3100	9.3600	0.0400	0.0500	0.4500	0.0000
22	8.5400	9.3600	9.4000	0.0300	0.0400	0.4600	0.0000
23	8.5500	9.4000	9.4100	0.0100	0.0100	0.4600	0.0000
24	8.5600	9.4100	9.4200	0.0100	0.0100	0.4600	0.0000
25	8.5700	9.4200	9.4700	0.0100	0.0500	0.5000	0.0000
26	8.5800	9.4700	9.5100	0.0100	0.0400	0.5300	0.0000
27	8.5900	9.5100	9.5400	0.0100	0.0300	0.5500	0.0000
28	9.0100	9.5400	9.5600	0.0200	0.0200	0.5500	0.0000
29	9.0800	9.5600	9.5700	0.0700	0.0100	0.4900	0.0000
30	9.1700	9.5700	9.5800	0.0900	0.0100	0.4100	0.0000
31	9.1800	9.5800	10.0200	0.0100	0.0400	0.4400	0.0000
32	9.2000	10.0200	10.0400	0.0200	0.0200	0.4400	0.0000
33	9.2100	10.0400	10.0500	0.0100	0.0100	0.4400	0.0000
34	9.2300	10.0500	10.0900	0.0200	0.0400	0.4600	0.0000
35	9.2400	10.0900	10.1100	0.0100	0.0200	0.4700	0.0000
36	9.2500	10.1100	10.1500	0.0100	0.0400	0.5000	0.0000
37	9.2900	10.1500	10.1900	0.0400	0.0400	0.5000	0.0000
38	9.3000	10.1900	10.2100	0.0100	0.0200	0.5100	0.0000
39	9.3200	10.2100	10.2200	0.0200	0.0100	0.5000	0.0000
40	9.4700	10.2200	10.2400	0.1500	0.0200	0.3700	0.0000
41	9.5000	10.2400	10.3000	0.0300	0.0600	0.4000	0.0000
42	9.5100	10.3000	10.3200	0.0100	0.0200	0.4100	0.0000
43	9.5800	10.3200	10.3700	0.0700	0.0500	0.3900	0.0000
44	9.5900	10.3700	10.4100	0.0100	0.0400	0.4200	0.0000
45	10.0100	10.4100	10.4200	0.0200	0.0100	0.4100	0.0000
46	10.0200	10.4200	10.4500	0.0100	0.0300	0.4300	0.0000
47	10.1400	10.4500	10.4800	0.1200	0.0300	0.3400	0.0000
48	10.1800	10.4800	10.5100	0.0400	0.0300	0.3300	0.0000

TIME FORMAT IS HH.MMSS WHERE H=HOURS,M=MINUTES & S=SECONDS

SIMULATED DATA LIST OF 06/09/90
********** PAGE: 2
COUNTER NO. 1

CUST. NO.	ARRIV. TIME	CALL TIME	DEPTU TIME	ARRIV. GAP	SERV. TIME	WATING TIME	COUNT. IDL.TIME
49	10.1900	10.5100	10.5700	0.0100	0.0600	0.3800	0.0000
50	10.2000	10.5700	10.5900	0.0100	0.0200	0.3900	0.0000
51	10.2900	10.5900	11.0000	0.0900	0.0100	0.3100	0.0000
52	10.3000	11.0000	11.0200	0.0100	0.0200	0.3200	0.0000
53	10.3200	11.0200	11.0300	0.0200	0.0100	0.3100	0.0000
54	10.3300	11.0300	11.0400	0.0100	0.0100	0.3100	0.0000
55	10.3400	11.0400	11.0700	0.0100	0.0300	0.3300	0.0000
56	10.3600	11.0700	11.1100	0.0200	0.0400	0.3500	0.0000
57	10.3900	11.1100	11.1200	0.0300	0.0100	0.3300	0.0000
58	10.4200	11.1200	11.1400	0.0300	0.0200	0.3200	0.0000
59	10.4300	11.1400	11.1800	0.0100	0.0400	0.3500	0.0000
60	10.4500	11.1800	11.2200	0.0200	0.0400	0.3700	0.0000
61	10.4600	11.2200	11.2900	0.0100	0.0700	0.4300	0.0000
62	10.5600	11.2900	11.3100	0.1000	0.0200	0.3500	0.0000
63	10.5700	11.3100	11.3200	0.0100	0.0100	0.3500	0.0000
64	10.5800	11.3200	11.3500	0.0100	0.0300	0.3700	0.0000
65	11.0000	11.3500	11.3900	0.0200	0.0400	0.3900	0.0000
66	11.0100	11.3900	11.4000	0.0100	0.0100	0.3900	0.0000
67	11.0500	11.4000	11.4100	0.0400	0.0100	0.3600	0.0000
68	11.0700	11.4100	11.4300	0.0200	0.0200	0.3600	0.0000
69	11.0900	11.4300	11.4900	0.0200	0.0600	0.4000	0.0000
70	11.1100	11.4900	11.5100	0.0200	0.0200	0.4000	0.0000
71	11.1300	11.5100	11.5500	0.0200	0.0400	0.4200	0.0000
72	11.1400	11.5500	11.5900	0.0100	0.0400	0.4500	0.0000
73	11.1500	11.5900	12.1000	0.0100	0.1100	0.5500	0.0000
74	11.1600	12.1000	12.1700	0.0100	0.0700	1.0100	0.0000
75	11.1800	12.1700	12.1900	0.0200	0.0200	1.0100	0.0000
76	11.2000	12.1900	12.2300	0.0200	0.0400	1.0300	0.0000
77	11.2300	12.2300	12.2600	0.0300	0.0300	1.0300	0.0000
78	11.2400	12.2600	12.2900	0.0100	0.0300	1.0500	0.0000
79	11.2500	12.2900	12.3100	0.0100	0.0200	1.0600	0.0000
80	11.2900	13.3000	13.4100	0.0400	0.1100	2.1200	0.0000
81	11.3000	13.4100	13.4500	0.0100	0.0400	2.1500	0.0000
82	11.3100	13.4500	13.4700	0.0100	0.0200	2.1600	0.0000
83	11.3900	13.4700	13.4800	0.0800	0.0100	2.0900	0.0000
84	11.4000	13.4800	13.4900	0.0100	0.0100	2.0900	0.0000
85	11.4100	13.4900	13.5000	0.0100	0.0100	2.0900	0.0000
86	11.4200	13.5000	13.5200	0.0100	0.0200	2.1000	0.0000
87	11.4400	13.5200	13.5900	0.0200	0.0700	2.1500	0.0000
88	11.4500	13.5900	14.1000	0.0100	0.1100	2.2500	0.0000
89	11.4600	14.1000	14.1400	0.0100	0.0400	2.2800	0.0000
90	11.4700	14.1400	14.1600	0.0100	0.0200	2.2900	0.0000
91	11.4900	14.1600	14.1800	0.0200	0.0200	2.2900	0.0000
92	11.5000	14.1800	14.2200	0.0100	0.0400	2.3200	0.0000
93	11.5100	14.2200	14.2600	0.0100	0.0400	2.3500	0.0000
94	11.5200	14.2600	14.2800	0.0100	0.0200	2.3600	0.0000
95	11.5300	14.2800	14.3200	0.0100	0.0400	2.3900	0.0000
96	11.5900	14.3200	14.3400	0.0600	0.0200	2.3500	0.0000

TIME FORMAT IS HH.MMSS WHERE H=HOURS,M=MINUTES & S=SECONDS

SIMULATED DATA LIST OF 06/09/90

********** PAGE: 4

COUNTER NO. 1

CUST. NO.	ARRIV. TIME	CALL TIME	DEPTU TIME	ARRIV. GAP	SERV. TIME	WATING TIME	COUNT. IDL.TIME
145	15.0100	17.0400	17.0500	0.0100	0.0100	2.0400	0.0000
146	17.0700	17.0700	17.0900	0.0200	0.0200	0.0200	0.0200
147	17.1000	17.1000	17.1100	0.0300	0.0100	0.0100	0.0100
148	17.1100	17.1100	17.2000	0.0100	0.0900	0.0900	0.0000
149	17.1300	17.2000	17.2300	0.0200	0.0300	0.1000	0.0000
150	17.1700	17.2300	17.2500	0.0400	0.0200	0.0800	0.0000
151	17.1800	17.2500	17.2600	0.0100	0.0100	0.0800	0.0000

SIMULATED DATA LIST OF 06/09/90
********** PAGE: 3
COUNTER NO. 1

CUST. NO.	ARRIV. TIME	CALL TIME	DEPTU TIME	ARRIV. GAP	SERV. TIME	WATING TIME	COUNT. IDL.TIME
97	12.0000	14.3400	14.3700	0.0100	0.0300	2.3700	0.0000
98	12.0100	14.3700	14.3900	0.0100	0.0200	2.3800	0.0000
99	12.0200	14.3900	14.4000	0.0100	0.0100	2.3800	0.0000
100	12.0300	14.4000	14.4100	0.0100	0.0100	2.3800	0.0000
101	12.0400	14.4100	14.4300	0.0100	0.0200	2.3900	0.0000
102	12.0600	14.4300	14.4400	0.0200	0.0100	2.3800	0.0000
103	12.0800	14.4400	14.4800	0.0200	0.0400	2.4000	0.0000
104	12.1000	14.4800	14.4900	0.0200	0.0100	2.3900	0.0000
105	12.1400	14.4900	14.5100	0.0400	0.0200	2.3700	0.0000
106	12.1600	14.5100	15.0200	0.0200	0.1100	2.4600	0.0000
107	12.1900	15.0200	15.0600	0.0300	0.0400	2.4700	0.0000
108	12.2000	15.0600	15.0800	0.0100	0.0200	2.4800	0.0000
109	12.2200	15.0800	15.1200	0.0200	0.0400	2.5000	0.0000
110	12.2400	15.1200	15.1500	0.0200	0.0300	2.5100	0.0000
111	12.2500	15.1500	15.1600	0.0100	0.0100	2.5100	0.0000
112	12.2800	15.1600	15.1800	0.0300	0.0200	2.5000	0.0000
113	12.2900	15.1800	15.2200	0.0100	0.0400	2.5300	0.0000
114	13.3100	15.2200	15.2400	0.0100	0.0200	1.5300	0.0000
115	13.3300	15.2400	15.2900	0.0200	0.0500	1.5600	0.0000
116	13.4500	15.2900	15.3400	0.1200	0.0500	1.4900	0.0000
117	13.5300	15.3400	15.3600	0.0800	0.0200	1.4300	0.0000
118	13.5400	15.3600	15.3800	0.0100	0.0200	1.4400	0.0000
119	13.5500	15.3800	15.4100	0.0100	0.0300	1.4600	0.0000
120	13.5600	15.4100	15.4400	0.0100	0.0300	1.4800	0.0000
121	13.5800	15.4400	15.4700	0.0200	0.0300	1.4900	0.0000
122	14.0000	15.4700	15.5400	0.0200	0.0700	1.5400	0.0000
123	14.0100	15.5400	15.5500	0.0100	0.0100	1.5400	0.0000
124	14.0200	15.5500	15.5600	0.0100	0.0100	1.5400	0.0000
125	14.0300	15.5600	15.5900	0.0100	0.0300	1.5600	0.0000
126	14.0500	15.5900	16.0000	0.0200	0.0100	1.5500	0.0000
127	14.0600	16.0000	16.0200	0.0100	0.0200	1.5600	0.0000
128	14.0900	16.0200	16.0500	0.0300	0.0300	1.5600	0.0000
129	14.1000	16.0500	16.0600	0.0100	0.0100	1.5600	0.0000
130	14.1300	16.0600	16.1000	0.0300	0.0400	1.5700	0.0000
131	14.2100	16.1000	16.1200	0.0800	0.0200	1.5100	0.0000
132	14.2300	16.1200	16.1800	0.0200	0.0600	1.5500	0.0000
133	14.2400	16.1800	16.2100	0.0100	0.0300	1.5700	0.0000
134	14.3100	16.2100	16.2400	0.0700	0.0300	1.5300	0.0000
135	14.3900	16.2400	16.2500	0.0800	0.0100	1.4600	0.0000
136	14.4000	16.2500	16.2700	0.0100	0.0200	1.4700	0.0000
137	14.4100	16.2700	16.3100	0.0100	0.0400	1.5000	0.0000
138	14.4300	16.3100	16.4000	0.0200	0.0900	1.5700	0.0000
139	14.4700	16.4000	16.4200	0.0400	0.0200	1.5500	0.0000
140	14.5300	16.4200	16.4600	0.0600	0.0400	1.5300	0.0000
141	14.5500	16.4600	16.5300	0.0200	0.0700	1.5800	0.0000
142	14.5700	16.5300	16.5500	0.0200	0.0200	1.5800	0.0000
143	14.5800	16.5500	16.5800	0.0100	0.0300	2.0000	0.0000
144	15.0000	16.5800	17.0400	0.0200	0.0600	2.0400	0.0000

TIME FORMAT IS HH.MMSS WHERE H=HOURS,M=MINUTES & S=SECONDS

SIMULATED DATA LIST OF 06/09/90

********** PAGE: 1

COUNTER NO. 2

CUST. NO.	ARRIV. TIME	CALL TIME	DEPTU TIME	ARRIV. GAP	SERV. TIME	WATING TIME	COUNT. IDL.TIME
1	8.4000	8.4000	8.4800	0.4000	0.0800	0.0800	0.1000
2	8.5500	8.5500	8.5700	0.1500	0.0200	0.0200	0.0700
3	9.1900	9.1900	9.2800	0.2400	0.0900	0.0900	0.2200
4	9.2400	9.2800	9.3200	0.0500	0.0400	0.0800	0.0000
5	9.4900	9.4900	9.5400	0.2500	0.0500	0.0500	0.1700
6	10.1000	10.1000	10.1900	0.2100	0.0900	0.0900	0.1600
7	10.2100	10.2100	10.2600	0.1100	0.0500	0.0500	0.0200
8	11.0600	11.0600	11.1100	0.4500	0.0500	0.0500	0.4000
9	11.5100	11.5100	11.5500	0.4500	0.0400	0.0400	0.4000
10	12.0200	12.0200	12.1100	0.1100	0.0900	0.0900	0.0700
11	12.0900	12.1100	12.2100	0.0700	0.1000	0.1200	0.0000
12	12.1100	12.2100	12.2600	0.0200	0.0500	0.1500	0.0000
13	12.1200	12.2600	12.3300	0.0100	0.0700	0.2100	0.0000
14	13.5300	13.5300	13.5600	0.2300	0.0300	0.0300	0.2000
15	13.5500	13.5600	14.0500	0.0200	0.0900	0.1000	0.0000
16	14.2100	14.2100	14.2600	0.2600	0.0500	0.0500	0.1600
17	14.2400	14.2600	14.2700	0.0300	0.0100	0.0300	0.0000
18	14.5300	14.5300	14.5800	0.2900	0.0500	0.0500	0.2600
19	15.3200	15.3200	15.3500	0.3900	0.0300	0.0300	0.3400
20	16.0000	16.0000	16.0300	0.2500	0.0300	0.0300	0.2500
21	16.0300	16.0300	16.0500	0.0300	0.0200	0.0200	0.0000
22	16.0800	16.0800	16.1500	0.0500	0.0700	0.0700	0.0300
23	16.4700	16.4700	16.5100	0.3900	0.0400	0.0400	0.3200
24	17.1300	17.1300	17.1600	0.2600	0.0300	0.0300	0.2200

QUEUING SYSTEM ANALYSIS REPORT FOR SIMULATED DATA

****

FOR COUNT NO: 1

FOR 6 WEEKS OF SIMULATED DATA
TOTAL NO OF ARRIVAL OF CUST. : 5672
AVERAGE NO OF ARRIVAL / DAY : 135
AVERAGE WATING TIME/CUSTOMER : 1 Hours 9 Minutes 15 Seconds
AVERAGE SERVICE TIME/CUSTOMER: 3 Minutes 24 Seconds
AVERAGE ARRIVAL GAP .....: 2 Minutes 56 Seconds
AVERAGE COUNT.IDLE TIME/DAY..: 22 Minutes 46 Seconds
TRAFFIC INTENSITY .....:1.16
SERVER UTILISATION .....: 76.37%

QUEUING SYSTEM ANALYSIS REPORT FOR SIMULATED DATA

****

FOR COUNT NO: 2

FOR 6 WEEKS OF SIMULATED DATA
TOTAL NO OF ARRIVAL OF CUST. : 1128
AVERAGE NO OF ARRIVAL / DAY : 27
AVERAGE WATING TIME/CUSTOMER : 6 Minutes 31 Seconds
AVERAGE SERVICE TIME/CUSTOMER: 4 Minutes 16 Seconds
AVERAGE ARRIVAL GAP .....: 17 Minutes 34 Seconds
AVERAGE COUNT.IDLE TIME/DAY..: 6 Hours 17 Minutes 20 Seconds
TRAFFIC INTENSITY .....:0.24
SERVER UTILISATION .....: 19.08%

QUEUING SYSTEM ANALYSIS REPORT FOR SIMULATED DATA

****

FOR COUNT NO: 3

FOR 6 WEEKS OF SIMULATED DATA
TOTAL NO OF ARRIVAL OF CUST. : 3188
AVERAGE NO OF ARRIVAL / DAY : 76
AVERAGE WATING TIME/CUSTOMER : 52 Minutes 48 Seconds
AVERAGE SERVICE TIME/CUSTOMER: 5 Minutes 32 Seconds
AVERAGE ARRIVAL GAP .....: 5 Minutes 40 Seconds
AVERAGE COUNT.IDLE TIME/DAY..: 1 Hours 5 Minutes 39 Seconds
TRAFFIC INTENSITY .....:0.98
SERVER UTILISATION .....: 70.00%

QUEUE LENGHT'S REPORT FOR SIMULATED DATA
****

FOR 6 WEEKS OF SIMULATED DATA

LONGEST QUEUE LENGHT FOR COUNTER NO .1	=	65
AVERAGE QUEUE LENGHT/DAY FOR COUNTER NO .1	=	16
LONGEST QUEUE LENGHT FOR COUNTER NO .2	=	5
AVERAGE QUEUE LENGHT/DAY FOR COUNTER NO .2	=	0
LONGEST QUEUE LENGHT FOR COUNTER NO .1	=	36
AVERAGE QUEUE LENGHT/DAY FOR COUNTER NO .1	=	7

Simulated data analysis report indicated that average number of arrivals per day was 135 for Counter Number 1. Average waiting time at this counter is 1 hour 9 minutes and 15 seconds. Average service time was 3 minutes 24 seconds. The time gap between arrivals was 2 minutes 56 seconds. Average counter idle time was 22 minutes 46 seconds. Traffic intensity at this counter was as high as 1.16. Server utilization was 76.37%. This counter issues tickets for the Sayadri train, II Class Reservation.

The average number of arrivals for Counter Number 2 has been 27 customers per day. Average waiting time was 6 minutes 31 seconds while average service time was 4 minutes 16 seconds. Average arrival gap recorded was 17 minutes 34 seconds. Average counter idle times were 6 hours 17 minutes 20 seconds per day. Traffic intensity was as low as 0.24. Server utilization was 19.08%. This counter issues tickets for both Mahalakshmi & Sayadri 1st Class and A/C reservations.

Counter Number 3 had an average arrival of 76 customers per day. Average waiting time per customer was 52 minutes 48 seconds. Average service time at this counter was 5 minutes 32 seconds. Average idle time per day was 1 hour 5 minutes 38 seconds. Traffic intensity was 0.98 and server utilization was 70% at this counter. This counter issues tickets for the Mahalakshmi train II Class Reservation.

Simulated data Graphs:

These graphs are generated by the computer to provide a pictorial representation of the simulated data. Graphs are drawn for the entire system as well as for individual counters. These graphs appear in subsequent pages of this section.

The purpose of these graphs is to highlight arrival patterns for individual counters and the whole system, and during various hours of the day to enable the researcher to draw conclusions with the help of these graphs. There are 8 different graphs in all, drawn with help of the computer, for simulated data.

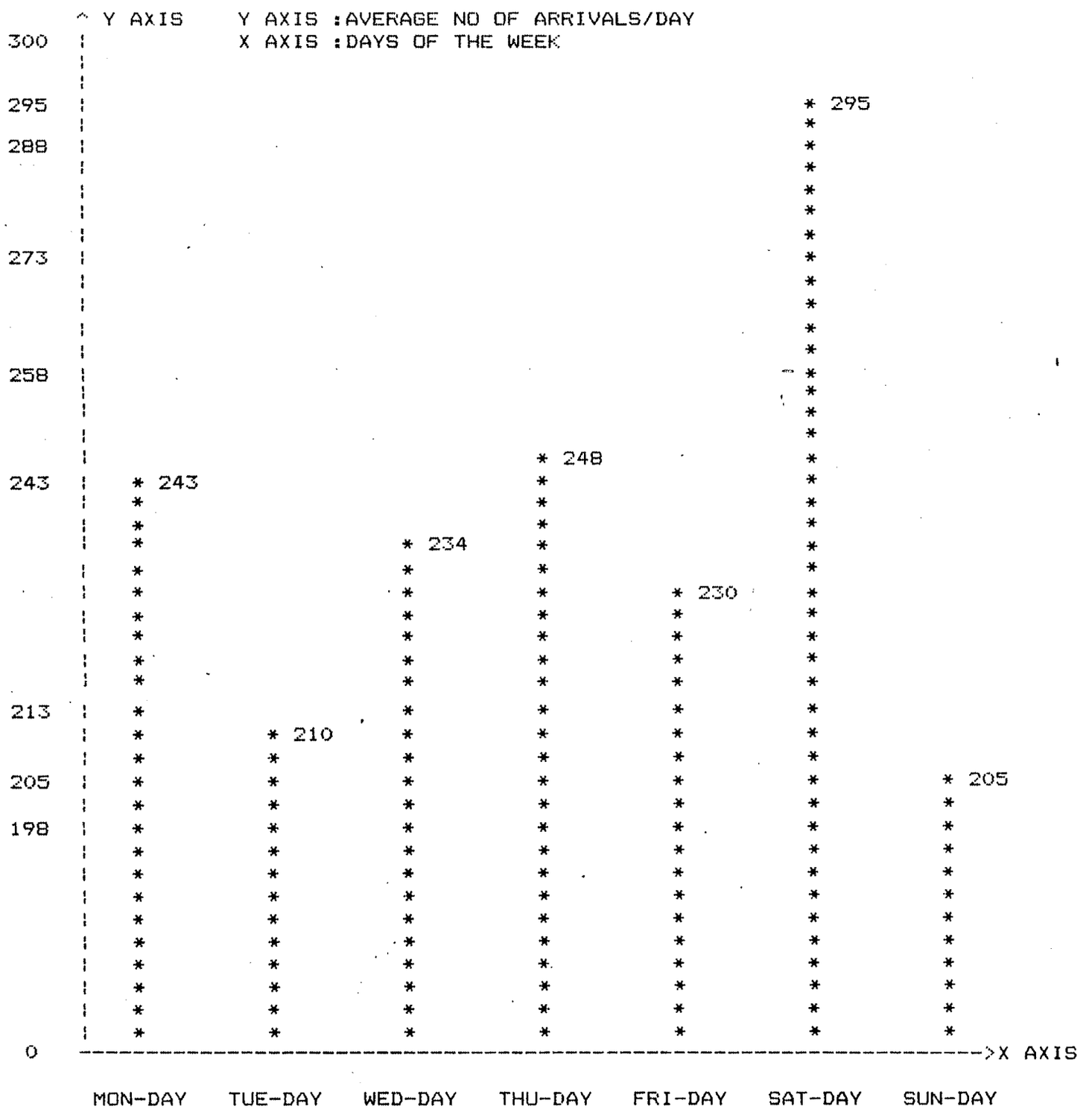
Graph Number 1: Relationship between number of arrivals and the days of the week, for the entire system.

Graph Number 2: Average number of arrivals v/s hours of the day, for the entire system.

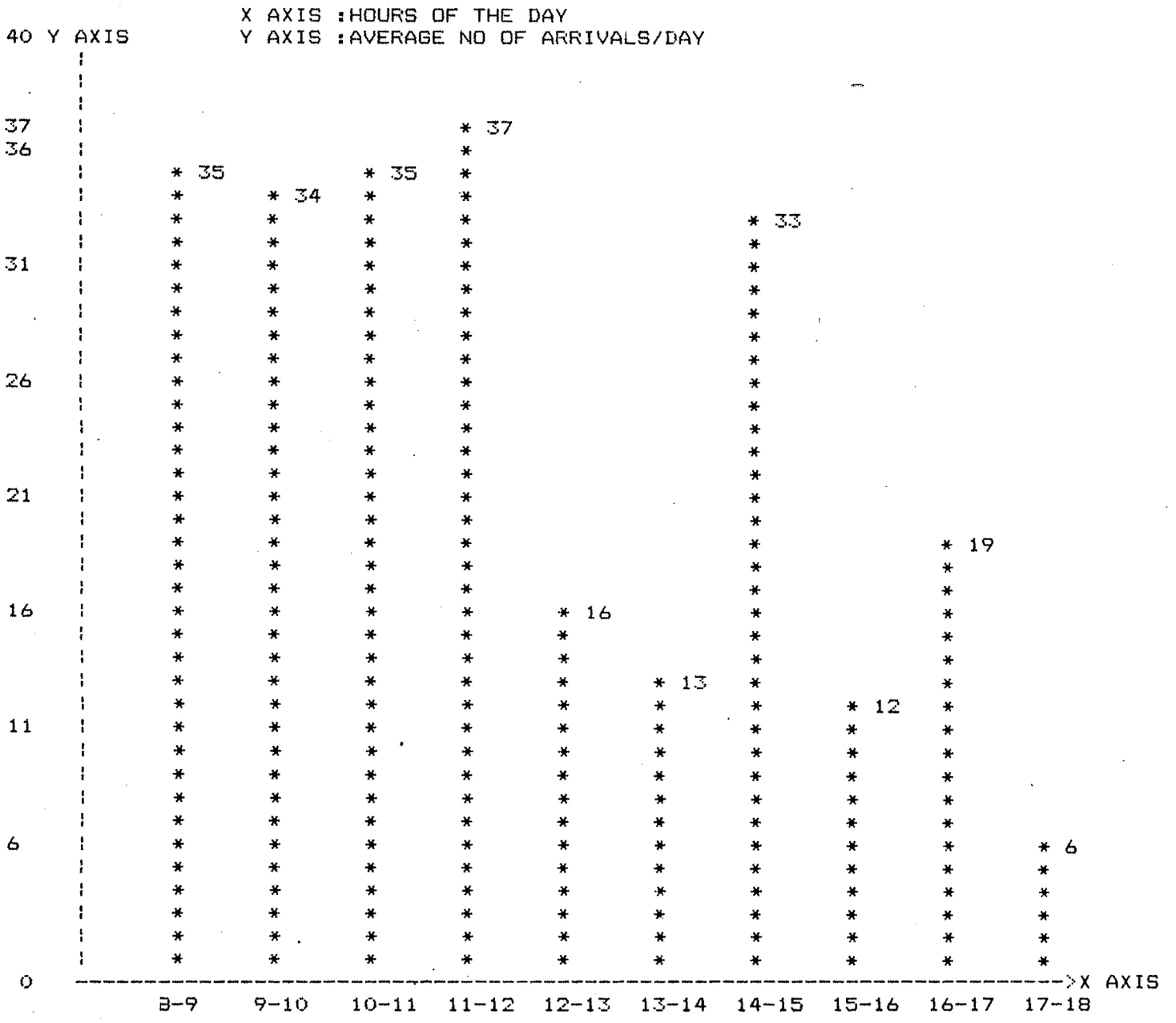
Graph Number 3,4,5: These graphs show average number of arrivals v/s days of the week, for individual counters.

Graph Number 6,7,8: These graphs represent the relationship between various hours of the day and average number of arrivals, at individual counters.

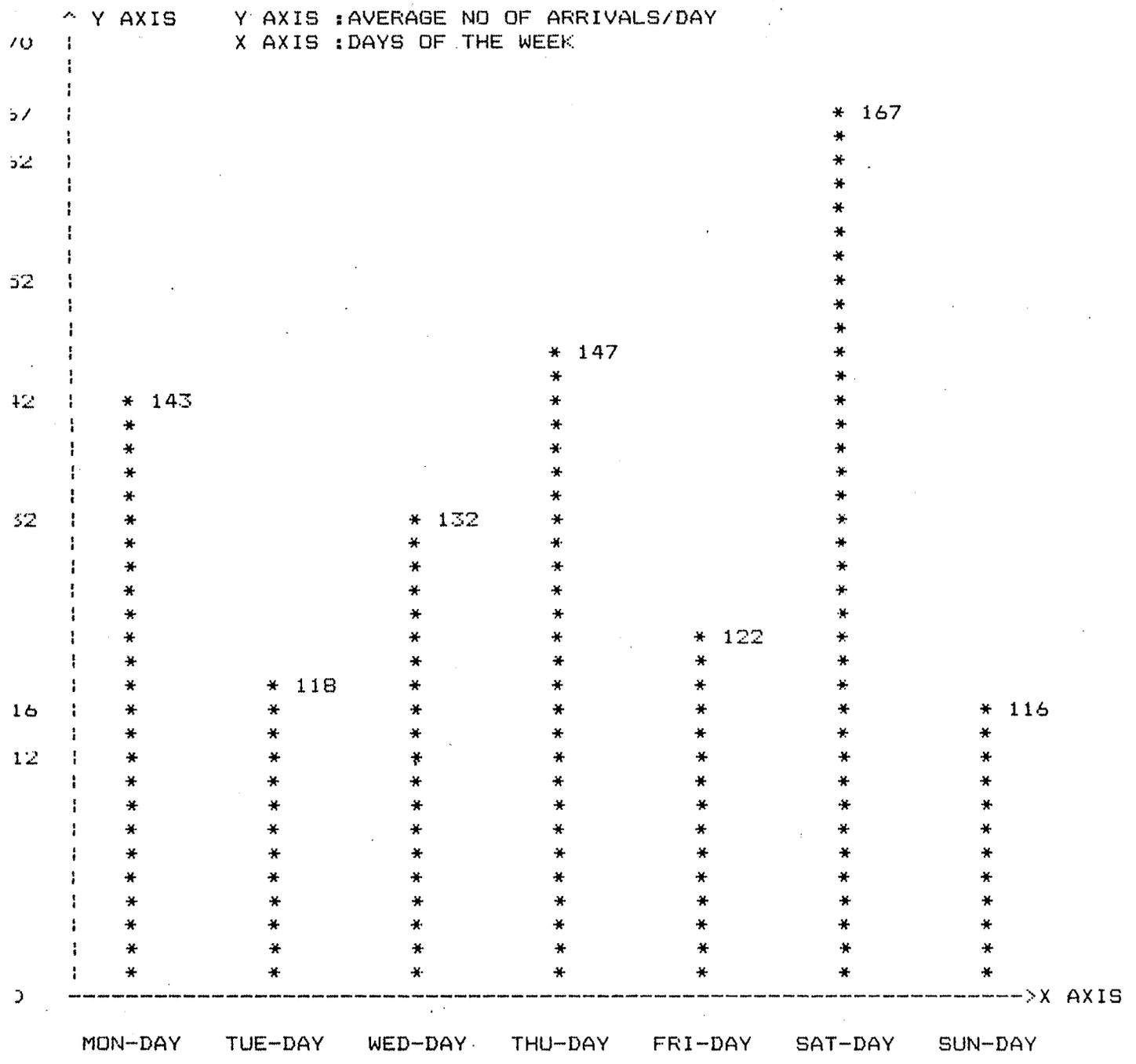
It is observed from the graphical analysis that maximum number of arrivals were on Mondays and Saturdays for the entire system as well as individual counters and the busiest hours of the day were the periods 8-11 am and 2-3 pm for the entire system as well as individual counters.



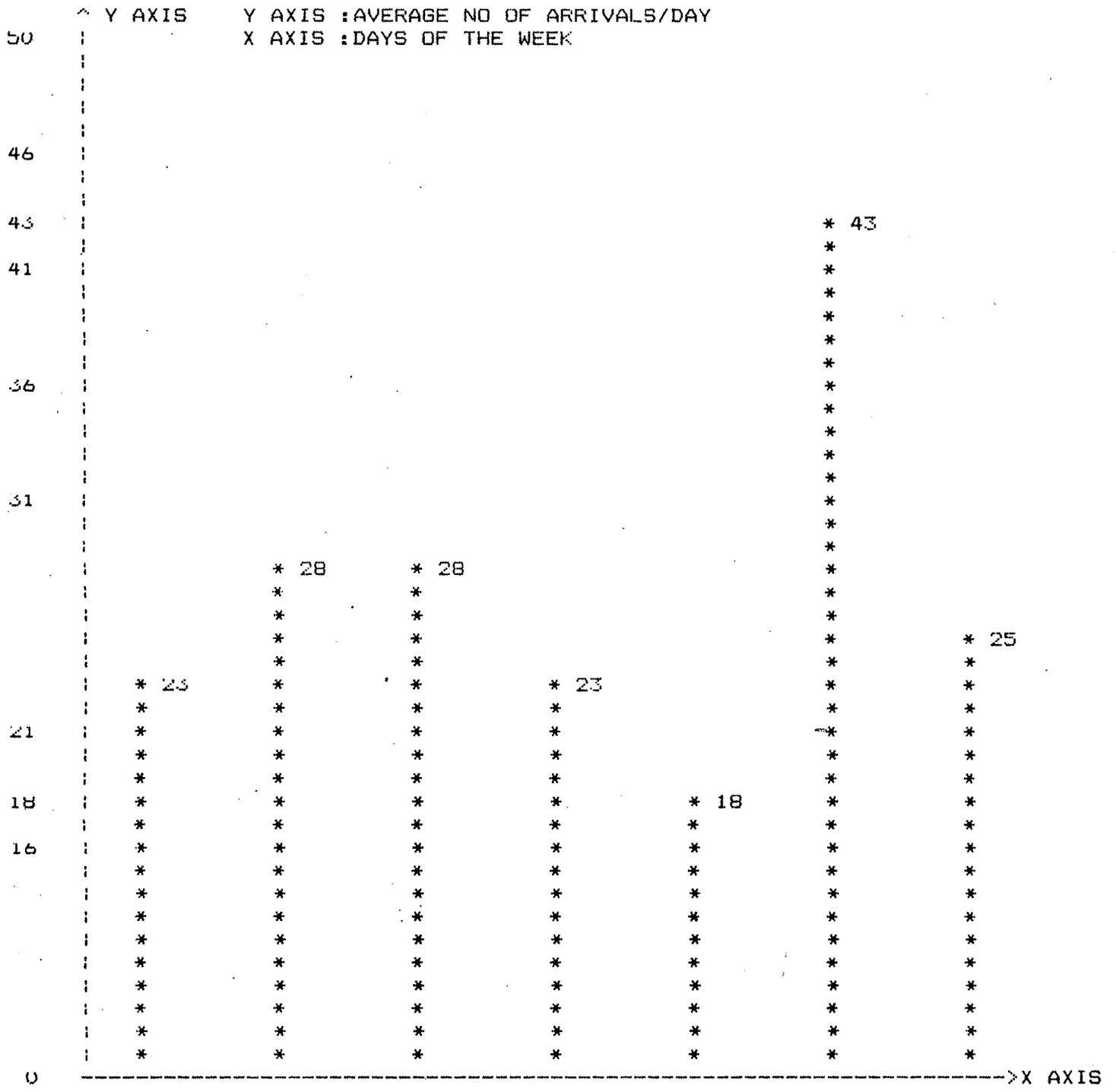
GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF SIMULATED DATA FOR THE WHOLE SYSTEM



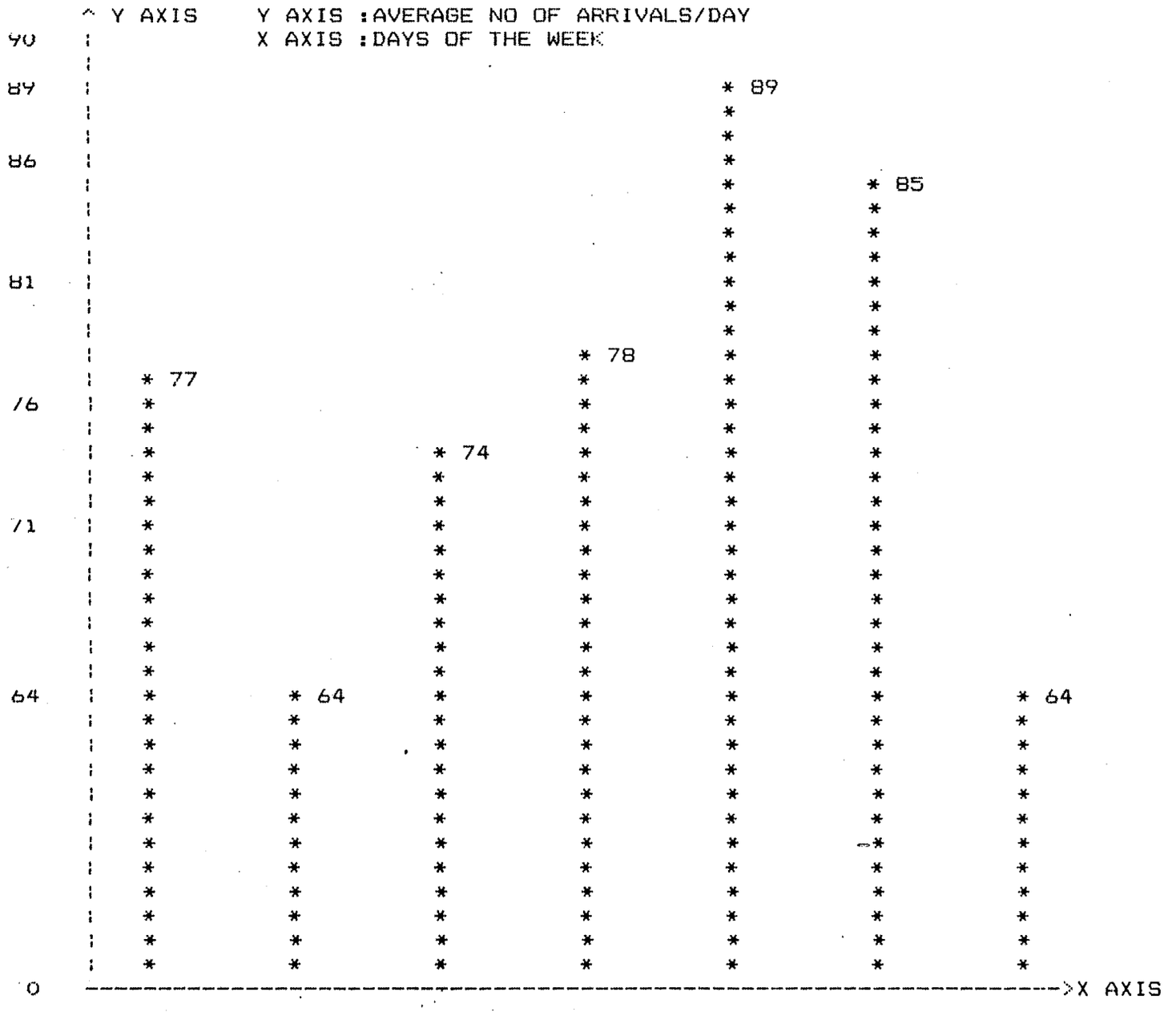
GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY
FOR THE WHOLE SYSTEM FORSIMULATED DATA



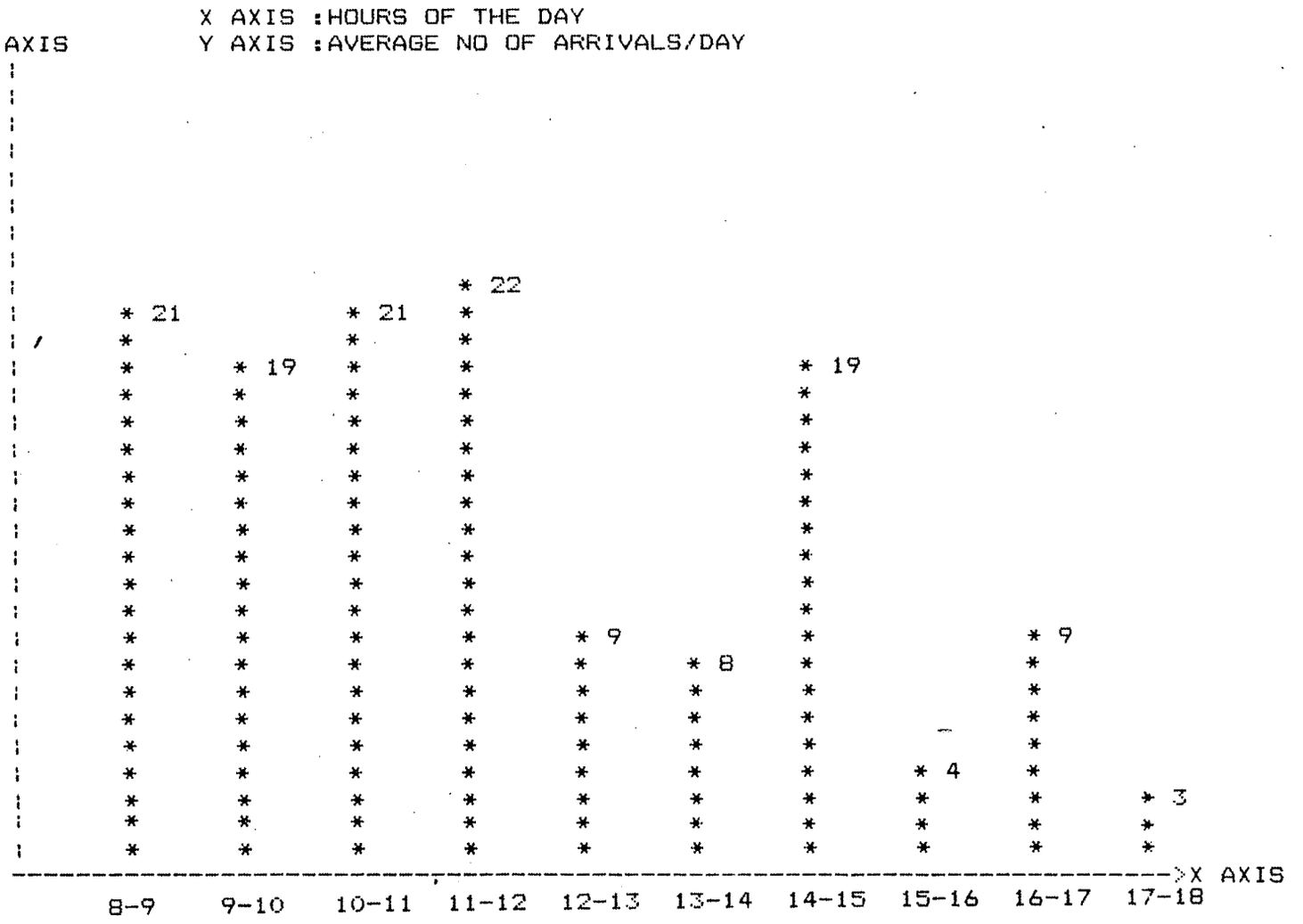
GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF SIMULATED DATA
FOR SIMULATED DATA FOR THE FIRST COUNTER



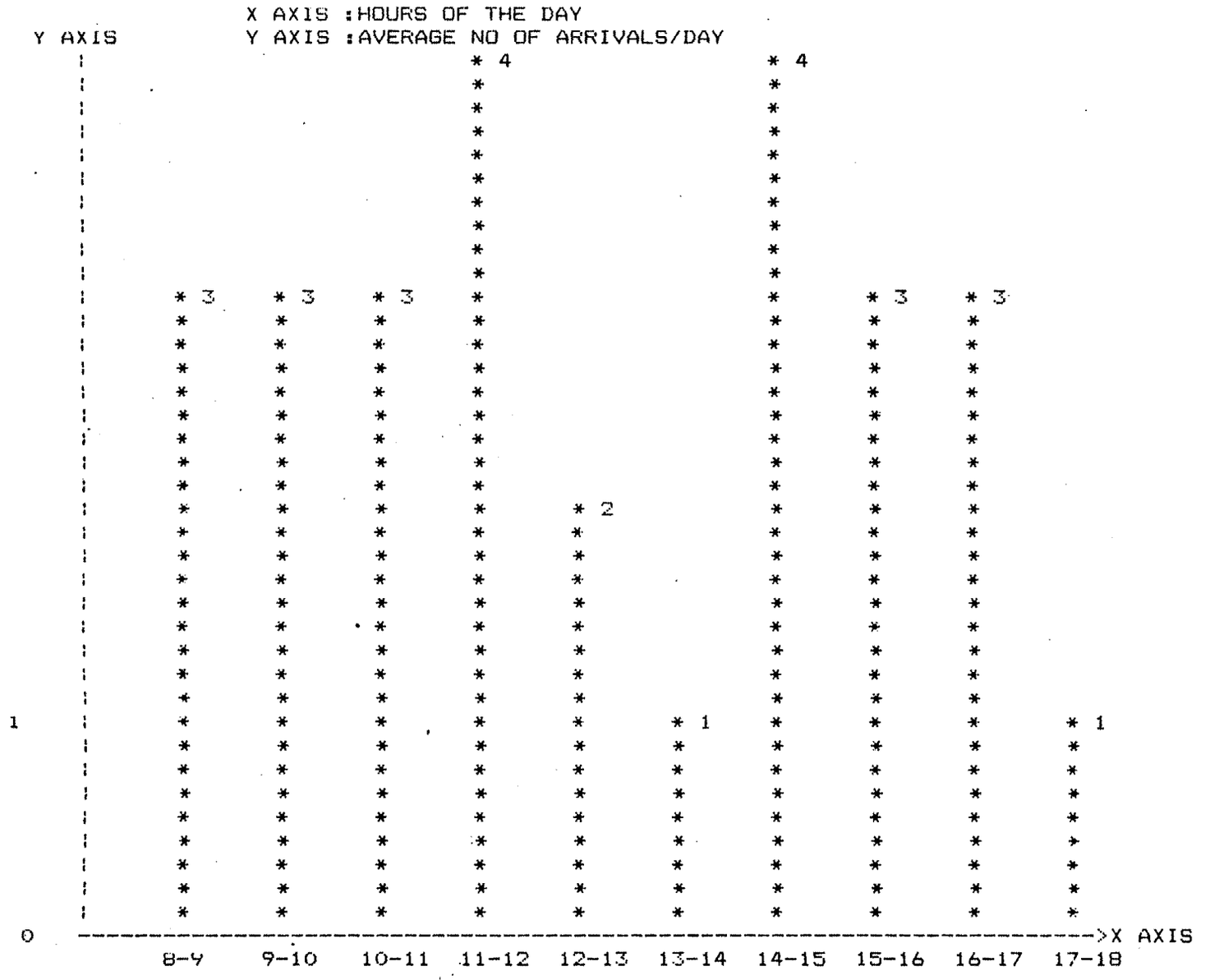
GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF SIMULATED DATA
FOR SIMULATED DATA FOR THE SECOND COUNTER



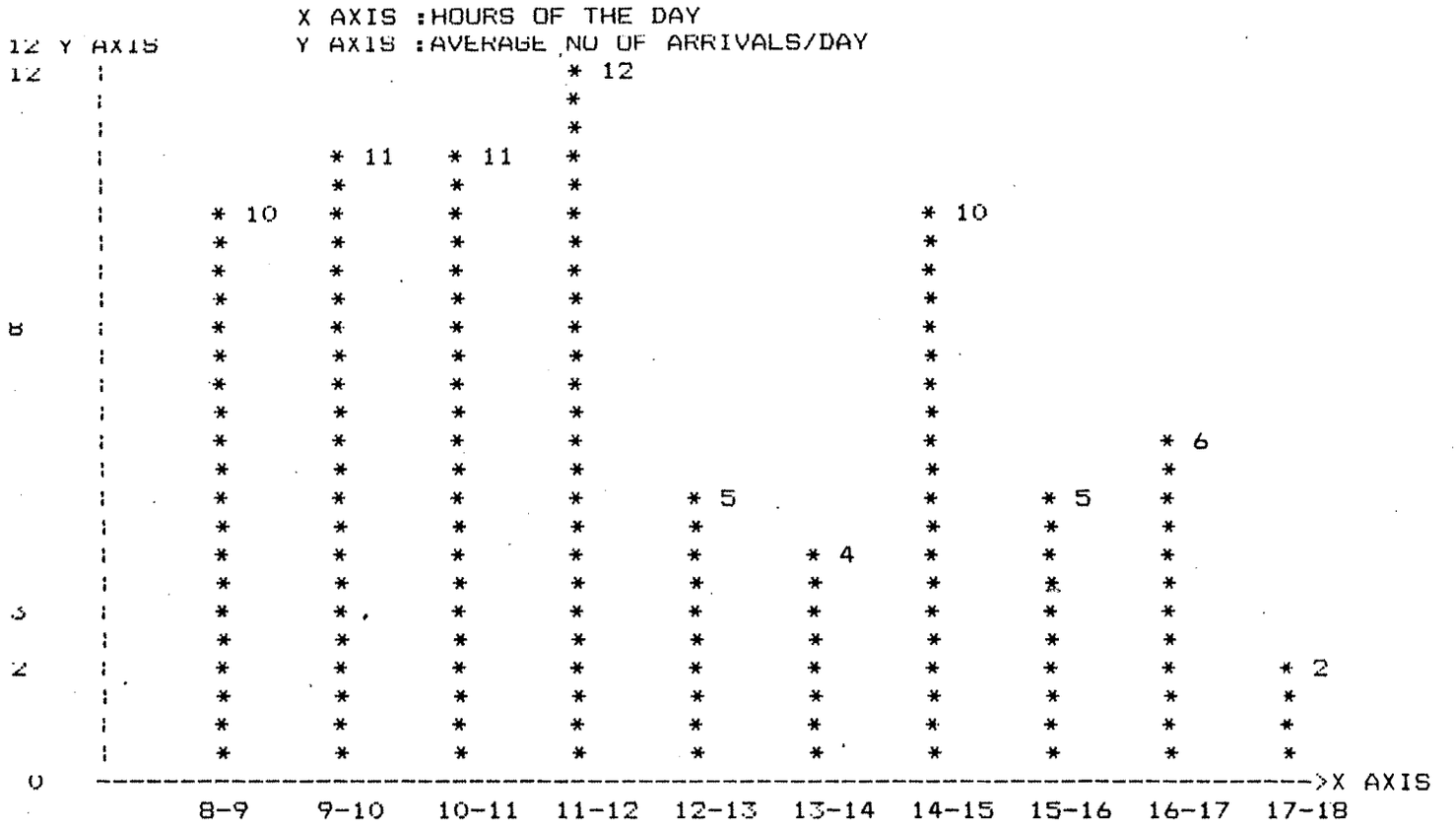
GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS WEEK DAYS OF SIMULATED DATA
FOR SIMULATED DATA FOR THE THIRD COUNTER



GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY
FOR SIMULATED DATA FOR THE FIRST COUNTER



GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY
FOR SIMULATED DATA FOR THE SECOND COUNTER



GRAPH FOR AVERAGE NO. OF ARRIVALS VERSUS HOURS OF DAY
FOR SIMULATED DATA FOR THE THIRD COUNTER