# 2

# SYSTEM DESCRIPTION TECHNIQUES

## 2.1 INTRODUCTION

Graphical representation of any process is always better and more meaningful than its representation in words. Moreover, it is very difficult to arrange and organize the large amount of data into meaningful interpretation of the whole. System Analysis and Design makes use of the various tools for representing and facilitating comprehension of the complex processes and procedure involved. In this lesson, we present some details about Flowchart, Data flow diagrams (DFD), Decision Tables and Decision Trees.

## 2.2 OBJECTIVES

After going through this lesson you would be able to

- draw flowchart
- represent any physical system through DFD
- prepare decision table
- display decision tree

## 2.3 FLOWCHART

The pictorial-representation of the programs or the algorithm is known as flowchart. It is nothing but a diagrammatic representation of the various steps involved in designing a system. Some of the symbols which are used in flowchart are:

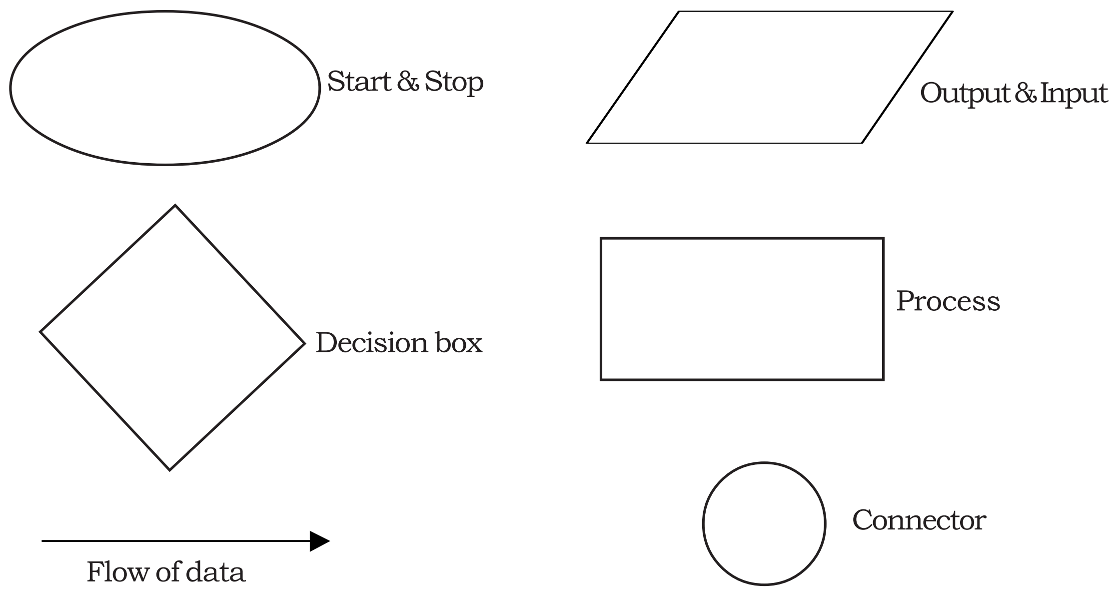


***Fig. 2.1: Flowchart Symbols***

A flowchart consists of a set of **'flowchart symbols'** connected by arrows. Each symbol contains information about what must be done at that point & the arrow shows the 'flow of execution' of the algorithm, i.e., they show the order in which the instructions must be executed. The purpose of using flowcharts is to graphically present the logical flow of data in the system and defining major phases of processing along with the various media to be used.

Flowcharts are of three types:

- System flowchart
- Run flowchart
- Program flowchart

### (a) System Flowcharts

System flowchart describes the data flow for a data processing system. It provides a logical diagram of how the system operates. It represents the flow of documents and the operations performed in data processing system. It also reflects the relationship between inputs, processing and outputs. Following are the features of system flowcharts:

- the sources from which data is generated and device used for this purpose
- various processing steps involved
- the intermediate and final output prepared and the devices used for their storage.

Figure 2.2 is a sample system flowchart for the following algorithm:

1. Prompt the user for the centigrade temperature.
2. Store the value in C
3. If temperature = 0 Stop
4. Set F to 32 + (9*C/5)
5. Print the value of C, F
6. Stop

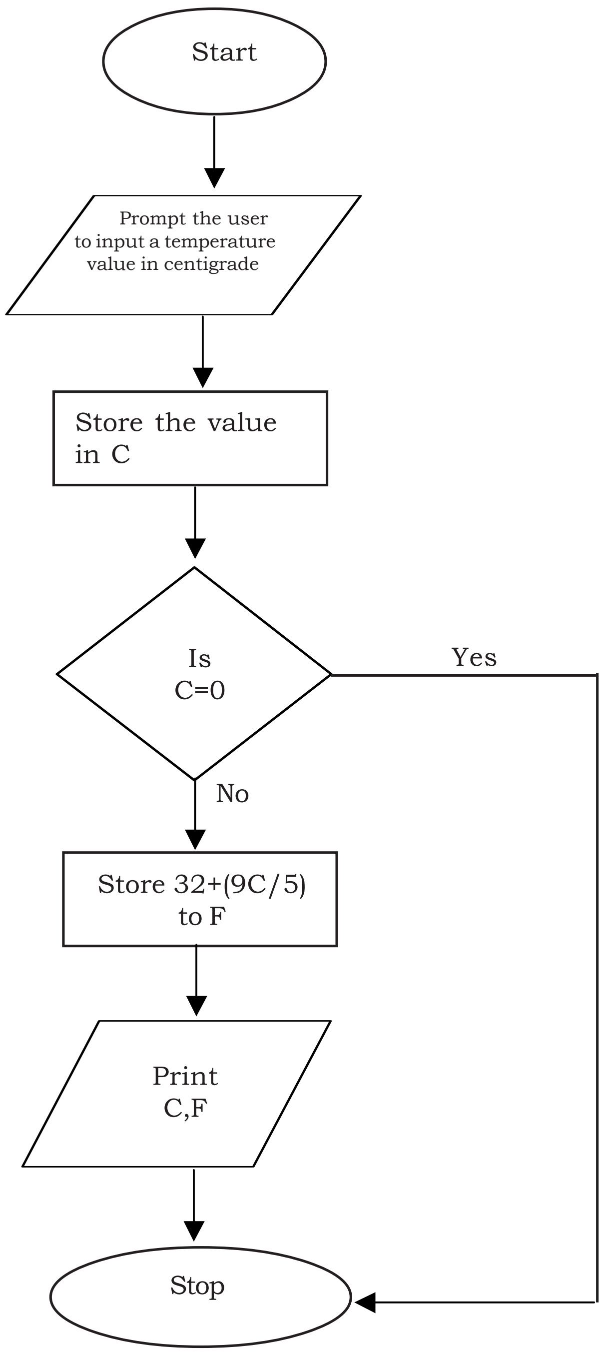


***Fig. 2.2: System Flowchart***

### (b) Run Flowchart

Run flowchart is used to represent the logical relationship of computer routines along with inputs, master files transaction files, and outputs. Figure 2.3 illustrates a run flowchart.

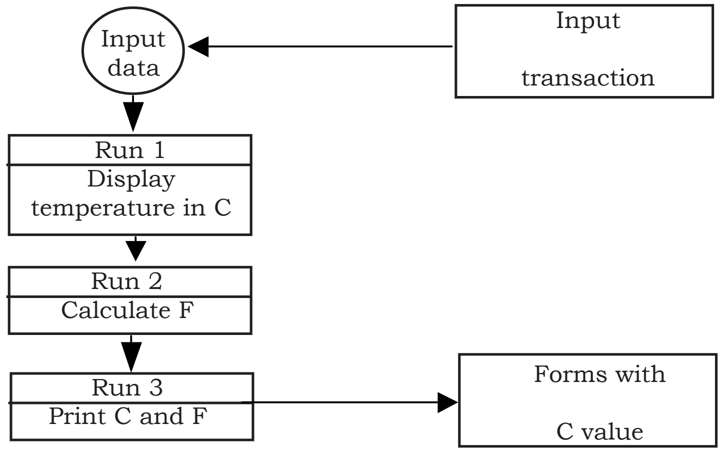


***Fig. 2.3: Run Flowchart***

### (c) Program Flowcharts

A program flowchart represents, in detail, the various steps to be performed within the system for transforming the input into output. The various steps are logical/arithmetic operation, algorithms, etc. It serves as the basis for discussion and communication between the system analyst and the programmer. Program flowcharts are quite helpful to programmers in organizing their programming efforts. These flowcharts constitute an important components of documentation for an application.

Figure 2.4 represents a program flowchart for finding the sum of first five natural numbers (i.e., 1,2,3,4,5).

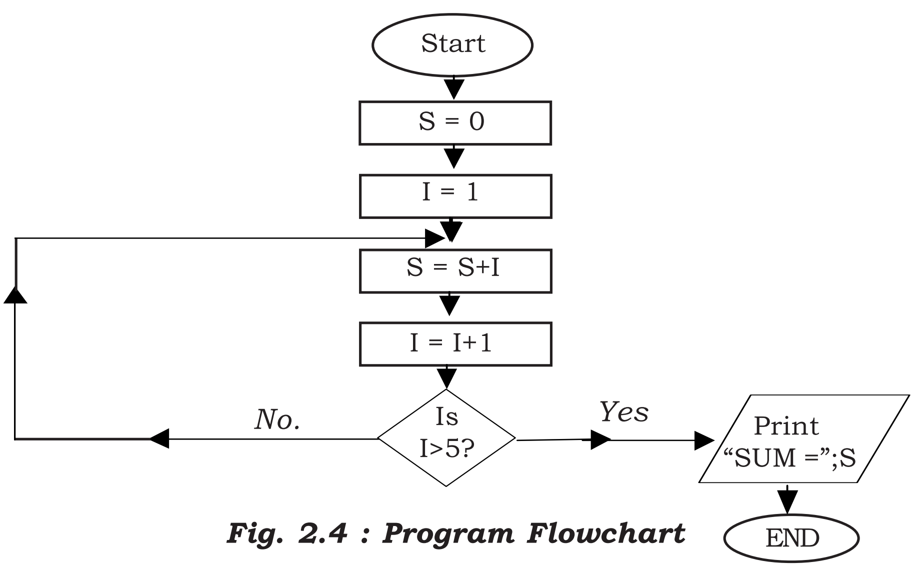


***Fig. 2.4 : Program Flowchart***

## 2.4 DATA FLOW DIAGRAM

Data flow diagrams are the most commonly used way of documenting the process of current and required systems. As their name suggest, they are a pictorial way of showing the flow of data into, around and out of a system.

### (a) Defining DFD

Graphical representation of a system's data and how the process transform the data is known as Data Flow Diagram (DFD). Unlike flowcharts, DFDs do not give detailed descriptions of modules but graphically describe a system's data and how the data interact with the component of a system.

### (b) Components of DFD

DFDs are constructed using four major components

- external entities
- data stores
- processes
- data flows

### (i) External Entities

External entities represent the sources of data as input to the system. They are also the destination of system data. External entities can be called data stores out side the system. These are represented by squares.

### (ii) Data Stores

Data stores represent stores of data within the system. Examples, computer files or databases. An open-ended box represents a data, which implies store data at rest or a temporary repository of data.

### (iii) Processes

Processes represents activities in which data is manipulated by being stored or retrieved or transferred in some way. In other words, we can say that process transforms the input data into output data. Circles stand for a process that converts data into information.

### (iv) Data Flows

Data flow represents the movements of data from one components to the other. An arrow identifies data flow – data in motion. It is a pipeline through which information flows. Data flows are generally shown as one-way only. Data flows between external entities are shown as dotted lines.

## (c) Physical & Logical DFD

Consider the Fig. 2.5. It is clear from the figure that orders are placed, orders are received, the location of ordered parts is determined and delivery notes are dispatched along with the order.


***Fig. 2.5***

It does not, however, tell us how these things are done or who does them. Are they done by computers or manually and if manually who does them? A logical DFD of any information system is one that models what occurs without showing how it occurs.

A physical DFD shows, how the various functions are performed and who does them. Consider the following figure:

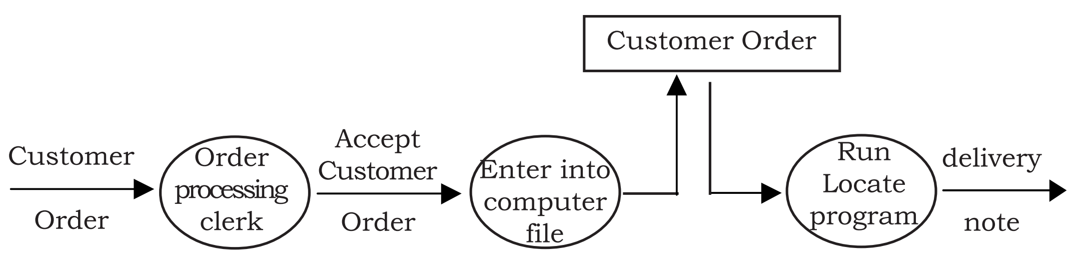


***Fig. 2.6***

Fig. *2.6 is opposite to the Fig. 2.5.* It shows the actual devices that perform the functions. Thus there is an "order processing clerk", an "entry into computer file" process and a "run locate program" process to locate the parts ordered. DFD that shows how things happen or the physical components, are called physical DFDs.

Typical processes that appear in physical DFDs are methods of data entry, specific data transfer or processing methods.

### (d) Difference between Flowcharts and DFDs

The program flowchart describes boxes that describe computations, decisions, interactions & loops. It is important to keep in mind that data flow diagrams are not program flowcharts and should not include control elements. A good DFD should

- have no data flows that split up into a number of other data flows
- have no crossing lines
- not include flowchart loops of control elements
- not include data flows that act as signals to activate processes

### INTEXT QUESTIONS

1. Write True or False for the following statements.
   - (a) The pictorial representation of the programs or the algorithm is know as flowchart.
   - (b) Flowcharts are of three types: system flowchart, run flowchart and program flowchart.
   - (c) Run flowchart describes the data flow for a data processing system.
   - (d) System flowchart represents the various steps to be performed within the system for transforming the input into output.
   - (e) Graphical representation of a systems data and how the processes transform the data is known as Data Flow Diagram.
   - (f) A good DFD should have crossing lines.
   - (g) External entities represent the source of data as input to the system.

## 2.5 DECISION TABLES AND DECISION TREES

Decision tables and trees were developed long before the widespread use of computers. They not only isolate many conditions and possible actions but they help ensure that nothing has been overlooked.

### (a) Decision Tables

The decision table is a chart with four sections listing all the logical conditions and actions. In addition, the top section allows space for title, date, author, system, and comment as shown in the Fig.2.7.

Following are the four sections of a decision table

| | |
|---|---|
| TITLE: | DATE; |
| Author: | System; |
| Comments: | |
| Condition Stub | Condition entry |
| Action Stub | Action Entry |

***Fig. 2.7: Decision Table***

The **Condition Stub** contains a list of all the necessary tests in a decision table. In the lower left-hand corner of the decision table we find the **Action Stub** where one may write all the processes desired in a given module. Thus Action Stub contains a list of all the processes involved in a decision table.

The upper right corner provides the space for the **Condition Entry** – all possible permutations of 'yes' and 'no' responses related to the condition stub. The 'yes' and 'no' possibilities are arranged as a vertical column called rules. Rules are numbered 1,2,3 and so on. We can determine the rules in a decision table by the formula:

Number of rules = 2^N = $2^N$ where N represents the number of condition and ^ means exponentiate. Thus a decision table with four conditions has 16=($2^4$ =2 X 2X 2X 2 = 16) rules. One with six conditions has 64 rules and eight conditions yield 256 rules.

The **Condition entry** contains a list of all the yes/no permutations in a decision table. The lower right corner holds the **action entry**.

X's or dots/dash indicate whether an action should occur as a consequence of the yes/no entries under condition entry. X's indicate an action should occur as a consequence of the yes/no entries under condition entry, while dots indicate no action.

Thus Action entry indicates via dot or X whether something should happen in a decision table or not. Let us consider the following example of book order illustrated by Fig 2.8

If order is from book store

And if order is for 6 copies

Then discount is 25%

Else (if order is for less then 6 copies)

No discount is allowed

else (if order is from libraries)

If order is for 50 copies or more

Then discount is 15%

Else if order is for 20 to 49 copies

Then discount is 10%

Else if order is for 6 to 19 copies

Then discount is 5%

Else (order is for less then 6 copies)

No discount is allowed

A decision table for the above process is illustrated below

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TITLE: | | DATE: | | | | | |
| Author: | | System: | | | | | |
| Comments: | | | | | | | |
| Condition Stub | | Condition entry | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| IF | Customer is bookstore | Y | Y | N | N | N | N |
| | Order size is 6 or more | Y | N | N | N | N | N |
| | Customer is library | N | N | Y | Y | Y | Y |
| | Order size is 50 or more | N | N | Y | N | N | N |
| | Order size is 20-49 | N | N | N | Y | N | N |
| | Order size is 6-19 | N | N | N | N | Y | N |
| Then | Allow 25% discount | X | - | - | - | - | - |
| | Allow 15% discount | - | - | X | - | - | - |
| | Allow 10% discount | - | - | - | X | - | - |
| | Allow 5% discount | - | - | - | - | X | - |
| | No discount | - | X | - | - | - | X |
| | Action Stub | Action Entry | | | | | |

***Fig. 2.8: Decision Table***

**(b) Decision Tree**

The decision tree defines the conditions as a sequence of left to right tests. A decision tree helps to show the paths that are possible in a design following an action or decision by the user. Fig. 2.9 illustrates the concept of decision tree.

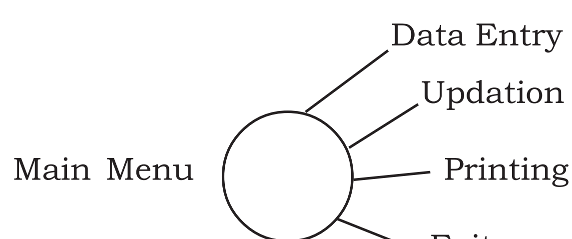


***Fig. 2.9: Decision Tree***

Decision tree turns a decision table into a diagram. This tool is read from left to right, decision results in a fork, and all branches end with an outcome. Fig. 2.10 illustrates the decision tree for the book order decision table we saw earlier.

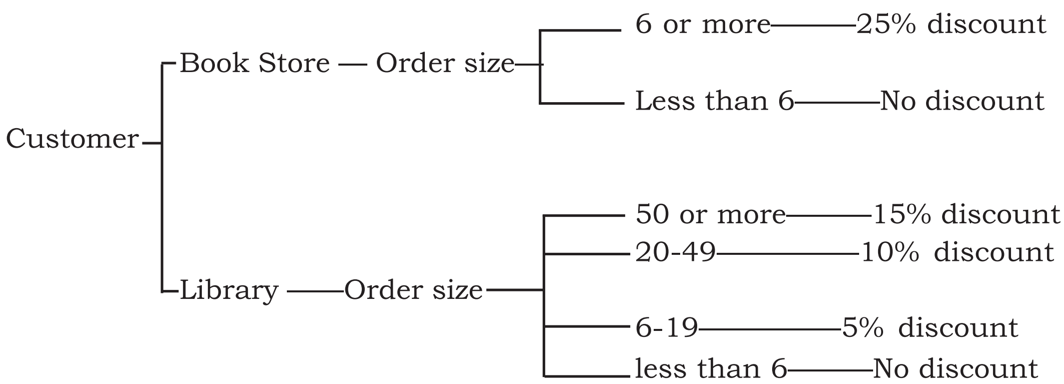


***Fig. 2.10 Decision Tree for Book Order***

**INTEXT QUESTIONS**

2. Write True or False for the following statements.

   (a) The condition stub contains a list of all necessary tests in a decision table.

   (b) The condition entry contains a list of all the yes/no permutations in a decision table.

   (c) The decision tree defines the conditions as a sequence of right to left tests.

   (d) A decision tree does not help to show the path that are possible in a design action or decision by the user.

   (e) The action stub contains a list of the processes involved in a decision table.

## 2.6 WHAT YOU HAVE LEARNT

Various specification tools and techniques of system analysis and designing were discussed in detail. Various tools such as flowcharts, data flow diagrams, decision tables & decision trees were explained. These tools and techniques are used when the system under study involves the development of computer based information system.

## 2.7 TERMINAL QUESTIONS

1. What is flow chart?
2. Explain different types of flow charts.
3. Define DFD and explain different components of DFD.
4. Explain decision table and decision tree.

## 2.8 KEY TO INTEXT QUESTIONS

1. (a) True (b) True (c) False (d) False (e) True (f) False (g) True

2. (a) True (b) True (c) False (d) False (e) True