CHAPTER 1

Introduction

(Solutions to Practice Set)

Review Questions

1. Turing proposed that all kinds of computation could be performed by a special kind of a machine. He based the model on the actions that people perform when involved in computation. He abstracted these actions into a model for a computational machine that has really changed the world.
2. The von Neumann Model defines the components of a computer, which are memory, the arithmetic logic unit (ALU), the control unit and the input/output subsystems.
3. Based on the Turing model a program is a set of instruction that tells the computer what to do.
4. The von Neumann model states that the program must be stored in the memory. The memory of modern computers hosts both programs and their corresponding data.
5. The subsystems of the von Neumann model are memory, the arithmetic/logic unit (ALU), the control unit, and the input/output.
6. Memory is the storage area used for programs and data.
7. The arithmetic/logic unit (ALU) is where calculations and logical operations take place.
8. The control unit controls the operations of the memory, ALU, and the input/output subsystem.
9. The input subsystem accepts input data and the program from outside the computer; the output subsystem sends the result of the processing to the outside.
10. The first generation (roughly 1950–1959) is characterized by the emergence of commercial computers and were used only by professionals. The second-generation (roughly 1959–1965) computers used transistors instead of vacuum tubes. The third generation (roughly 1965 and 1975.) started with the invention of the integrated circuit that reduced the cost and size of computers even further. The fourth generation (approximately 1975–1985) saw the appearance of microcomputers.

The fifth generation started in 1985. It witnessed the appearance of laptop and palmtop computers, improvements in secondary storage media (CD-ROM, DVD, etc.), the use of multimedia, and the phenomenon of virtual reality.

Multiple-Choice Questions

11. b	12. c	13. a	14. b	15. d	16. c
17. d	18. c	19. a	20. d	21. a	22. c
23. d	24. d	25. c			

Exercises

26. To solve a problem, a computer follows a set of instructions called a program, This set of instructions is written based on the paper-and-pencil solution to the problem. If there is no solution to the problem outside of the computer, we cannot write such a program.
27. According to Turing, any problem that can be solved by a big computer can also be solve by a small computer but a big computer can probably solve the problem faster.
28. In the Turing model, a computer consists of input data, output data and a program. Pascaline calculator, which is an addition/subtraction machine, is not a computer according to this model because it lacks the program component.
29. In the Turing model, a computer consists of input data, output data and a program. Leibnit's wheel is not a computer according to this model because it lacks the program component.
30. In the Turing model, a computer consists of input data, output data and a program. In the Jacquard Loom, a program (punch cards) was used to control the output (the pattern of the loom's weave). Therefore, based on the Turing model, it is a computer.
31. The Analytical Engine has all four components of the von Neumann model: a mill (ALU), a store (memory), an operator (control unit), and output (input/output), but the program was not stored in the memory. Therefore, it is not a computer according to the von Neumann model.
32. The first computer based on the von Neumann model was first considered to be ENVAC (made in 1950). However, there has been controversy and court battle and in 1973 District Court invalidated the ENIAC patent and concluded that the ABC (made in 1950) was the first computer.
33. The first keyboard appear with time sharing, multi-user system by 1964 which is end of the second generation and the beginning of the third generation.
34. In 1953, the first high-speed printer was developed by Remington-Rand for use on the UNIVAC computer. This means that printers belong to the first generation of computers.

35. The hard disk may be used as either an input device or an output device. When data or programs are read from the disk, the disk is considered an input device. When data or programs are written to the disk, the disk is considered an output device.

36.

    a. For five-instruction program, we can write 10^5 = 100,000 different programs (each line can be one of the ten instruction).

    b. For seven-instruction program, we can write 10^7 = 10,000,000 different programs.

37. The set of data is the most valuable asset of most organizations. An organization can replace its hardware and software if they are lost (due to theft, fire, etc.) and usually they replace them every few years as hardware or software become obsolete, but the set of data is indispensable.