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CHAPTER 1

Introduction

(Solutions to Review Questions and Problems)

Review Questions

Q1-1. 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.

Q1-2. 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.

Q1-3. Based on the Turing model a program is a set of instruction that tells the computer what to do.

Q1-4. 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.

Q1-5. The subsystems of the von Neumann model are memory, the arithmetic/logic unit (ALU), the control unit, and the input/output.

Q1-6. Memory is the storage area used for programs and data.

Q1-7. The arithmetic/logic unit (ALU) is where calculations and logical operations take place.

Q1-8. The control unit controls the operations of the memory, ALU, and the input/output subsystem.

Q1-9. 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.

Q1-10. 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, witnessed the appearance of laptop and palmtop computers, improvements in sec-

ondary storage media (CD-ROM, DVD, etc.), the use of multimedia, and the phenomenon of virtual reality.

Problems

P1-1. 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.

P1-2. 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.

P1-3. 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.

P1-4. 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.

P1-5. 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.

P1-6. 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.

P1-7. 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.

P1-8. 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.

Quizzes: Chapter 01

1. The _____ model is the basis for today's computers.
   a. Leibnitz
   b. von Neumann
   c. Pascal
   d. Charles Babbage
   Correct Answer: (b)

2. In a computer, the _____ subsystem stores data and programs.
   a. ALU
   b. input/output
   c. memory
   d. control unit
   Correct Answer (c)

3. In a computer, the _____ subsystem performs calculations and logical operations.
   a. ALU
   b. input/output
   c. memory
   d. control unit
   Correct Answer (a)

4. In a computer, the _____ subsystem accepts data and programs and sends processing results to output devices.
   a. ALU
   b. input/output
   c. memory

d. control unit
Correct Answer (b)

5. In a computer, the _____ subsystem serves as a manager of the other subsystems.
a. ALU
b. input/output
c. memory
d. control unit
Correct Answer (d)

6. According to the von Neumann model, _____ are stored in memory.
a. only data
b. only programs
c. data and programs
d. neither data nor programs
Correct Answer (c)

7. A step-by-step solution to a problem is called _____.
a. hardware
b. an operating system
c. a computer language
d. an algorithm
Correct Answer (d)

8. FORTRAN and COBOL are examples of _____.
a. hardware
b. operating systems
c. computer languages
d. algorithms
Correct Answer (c)

9. A 17th-century computing machine that could perform addition and subtraction was the _____.
a. Pascaline

b. Jacquard loom
c. Analytical Engine
d. Babbage machine
Correct Answer (a)

10. _____ is a set of instructions in a computer language that tells the computer what to do with data.
a. An operating system
b. An algorithm
c. A data processor
d. A program
Correct Answer (d)

11. _____ is the design and writing of a program in structured form.
a. Software engineering
b. Hardware engineering
c. Algorithm development
d. Instructional architecture
Correct Answer (a)

12. The first electronic special-purpose computer was called _____.
a. Pascal
b. Pascaline
c. ABC
d. ENIAC
Correct Answer (c)

13. One of the first computers based on the von Neumann model was called _____.
a. Pascal
b. Pascaline
c. ABC
d. EDVAC
Correct Answer (d)

14. The first computing machine to use the idea of storage and programming was called _____.
    a. the Madeline
    b. EDVAC
    c. the Babbage machine
    d. the Jacquard loom
    Correct Answer (d)

15. _____ separated the programming task from computer operation tasks.
    a. Algorithms
    b. Data processors
    c. High-level programming languages
    d. Operating systems
    Correct Answer (c)