

Computer Organization and Architecture

Question Bank

Unit 1

1. What, in general terms, is the distinction between computer organization and computer architecture?
2. What, in general terms, is the distinction between computer structure and computer function?
3. What are the four main functions of a computer?
4. List and briefly define the main structural components of a computer.
5. List and briefly define the main structural components of a processor.
6. What general categories of functions are specified by computer instructions?
7. List and briefly define the possible states that define an instruction execution.
8. Briefly explain the following representations: sign magnitude, twos complement, biased.
9. Explain how to determine if a number is negative in the following representations: sign magnitude, twos complement, biased.
10. What is the sign-extension rule for twos complement numbers?
11. How can you form the negation of an integer in twos complement representation?
12. In general terms, when does the twos complement operation on an n-bit integer produce the same integer?
13. What is the difference between the twos complement representation of a number and the twos complement of a number?
14. If we treat 2 twos complement numbers as unsigned integers for purposes of addition, the result is correct if interpreted as a twos complement number. This is not true for multiplication. Why?
15. What are the four essential elements of a number in floating-point notation?
16. What is the benefit of using biased representation for the exponent portion of a floating-point number?
17. What are the differences among positive overflow, exponent overflow, and significand overflow?
18. What are the basic elements of floating-point addition and subtraction?
19. Give a reason for the use of guard bits.
20. List four alternative methods of rounding the result of a floating-point operation.

Unit 2

1. What are the differences among sequential access, direct access, and random access?
2. What is the general relationship among access time, memory cost, and capacity?
3. How does the principle of locality relate to the use of multiple memory levels?
4. What are the differences among direct mapping, associative mapping, and setassociative mapping?

5. For a direct-mapped cache, a main memory address is viewed as consisting of three fields. List and define the three fields.
6. For an associative cache, a main memory address is viewed as consisting of two fields. List and define the two fields.
7. For a set-associative cache, a main memory address is viewed as consisting of three fields. List and define the three fields.
8. A set-associative cache consists of 64 lines, or slots, divided into four-line sets. Main memory contains 4K blocks of 128 words each. Show the format of main memory addresses.
9. A two-way set-associative cache has lines of 16 bytes and a total size of 8 kbytes. The 64-Mbyte main memory is byte addressable. Show the format of main memory addresses.

Unit 3

- 1 List three broad classifications of external, or peripheral, devices.
- 2 What is the International Reference Alphabet?
- 3 What are the major functions of an I/O module?
- 4 List and briefly define three techniques for performing I/O.
- 5 What is the difference between memory-mapped I/O and isolated I/O?
- 6 When a device interrupt occurs, how does the processor determine which device issued the interrupt?
- 7 When a DMA module takes control of a bus, and while it retains control of the bus, what does the processor do?

Unit 4

- 1 Briefly define immediate addressing.
- 2 Briefly define direct addressing.
- 3 Briefly define indirect addressing.
- 4 Briefly define register addressing.
- 5 Briefly define register indirect addressing.
- 6 Briefly define displacement addressing.
- 7 Briefly define relative addressing.
- 8 What is the advantage of autoindexing?
- 9 What is the difference between postindexing and preindexing?
- 10 What facts go into determining the use of the addressing bits of an instruction?
- 11 What are the advantages and disadvantages of using a variable-length instruction format?

Unit 5

- 1 What general roles are performed by processor registers?
- 2 What categories of data are commonly supported by user-visible registers?
- 3 What is the function of condition codes?
- 4 What is a program status word?
- 5 Why is a two-stage instruction pipeline unlikely to cut the instruction cycle time in

- 6 half, compared with the use of no pipeline?
- 7 List and briefly explain various ways in which an instruction pipeline can deal with
- 8 conditional branch instructions.
- 9 How are history bits used for branch prediction?
- 10 What is the essential characteristic of the superscalar approach to processor design?
- 11 What is the difference between the superscalar and superpipelined approaches?
- 12 What is instruction-level parallelism?
- 13 Briefly define the following terms:
 - True data dependency
 - Procedural dependency
 - Resource conflicts
 - Output dependency
 - Antidependency
- 14 What is the distinction between instruction-level parallelism and machine parallelism?
- 15 List and briefly define three types of superscalar instruction issue policies.
- 16 What is the purpose of an instruction window?
- 17 What is register renaming and what is its purpose?
- 18 What are the key elements of a superscalar processor organization?

Unit 6

- 1 What is the difference between a hardwired implementation and a microprogrammed implementation of a control unit?
- 2 How is a horizontal microinstruction interpreted?
- 3 What is the purpose of a control memory?
- 4 What is a typical sequence in the execution of a horizontal microinstruction?
- 5 What is the difference between horizontal and vertical microinstructions?
- 6 What are the basic tasks performed by a microprogrammed control unit?
- 7 What is the difference between packed and unpacked microinstructions?
- 8 What is the difference between hard and soft microprogramming?
- 9 What is the difference between functional and resource encoding?
- 10 List some common applications of microprogramming.