

KARA TUTORING®

CSC 252

1. What are the two major factors used to categorize parallel processing systems?

Correct Answer: The multiple processing units themselves and the interconnection network that ties them together

2. What is the primary purpose of parallel processing?

Correct Answer: To enhance the computer processing capability and increase its throughput

3. What are the two methods by which processing units in a multiprocessor system can communicate and interact with each other?

Correct Answer: Shared memory or message passing methods

4. What is the main advantage of using a multiprocessor system in terms of fault tolerance?

Correct Answer: If a processor fails, the remaining processors should be able to provide continued service, albeit with degraded performance

5. What is the difference between bit-level parallelism and instruction-level parallelism?

Correct Answer: Bit-level parallelism is based on increasing the processor's size to reduce the

number of instructions for large-sized data, while instruction-level parallelism involves re-ordering and grouping instructions to execute concurrently without affecting the program result

6. What are the four generations of computer architecture technologies?

Correct Answer: Vacuum tubes, Transistors, Integrated circuits, VLSIC

7. What is the primary goal of parallel computer architecture?

Correct Answer: To achieve higher performance by utilizing a large number of processors

8. What are the two types of parallelism that can be transparent to the programmer?

Correct Answer: Bit-level or instruction-level parallelism

9. What are the two main obstacles to achieving optimal parallel program performance?

Correct Answer: Communication and synchronization between the different subtasks

10. What is the primary advantage of parallel computing over serial computing in terms of resource utilization?

Correct Answer: Parallel computing makes better use of hardware by not wasting potential computing power

11. What are the four components of microprocessor-based computers in the mid-80s?

Correct Answer: An integer processing unit, a floating-point unit, a cache controller, SRAMs for the cache data

12. What is the term for the type of instruction level parallelism where multiple instructions are fetched at a time and sent in parallel to different functional units?

Correct Answer: Super scalar execution

13. What are the three classification methods used to categorize parallel computers?

Correct Answer: Flynn, Feng, Handler

14. What are the four categories in Flynn's taxonomy?

Correct Answer: SISD, SIMD, MISD, MIMD

15. What is the primary difference between SISD and SIMD architectures?

Correct Answer: SISD executes a single instruction on a single data stream, while SIMD executes the same instruction on multiple data streams.

16. What are the two main types of MIMD machines based on memory coupling?

Correct Answer: Shared-memory MIMD and distributed-memory MIMD

17. What is the key innovation of the Cray architecture in vector machines?

Correct Answer: A vector register file

18. What is the primary benefit of vector load/store instructions in vector architectures?

Correct Answer: They promote data locality, reduce data pollution, and provide latency tolerance.

19. What is the mechanism by which the instruction stream is divided into several smaller streams for execution in multithreading?

Correct Answer: Threads

20. What is the primary goal of hardware multithreading?

Correct Answer: Increasing utilization of a processor by switching to another thread when one thread is stalled.

21. What are the three types of multithreading discussed?

Correct Answer: Coarse-grained Multithreading, Fine-grained Multithreading, Simultaneous Multithreading

22. What is the primary advantage of coarse-grained multithreading?

Correct Answer: It does not slow down thread execution

23. What is the main disadvantage of fine-grained multithreading?

Correct Answer: It slows down the execution of individual threads

24. What is the key insight that motivates Simultaneous Multithreading (SMT)?

Correct Answer: Multiple-issue processors often have more functional unit parallelism available than most single threads can effectively use

25. What is the primary advantage of Simultaneous Multithreading (SMT)?

Correct Answer: It boosts utilization by dynamically scheduling functional units among multiple threads

26. What is the primary disadvantage of Simultaneous Multithreading (SMT)?

Correct Answer: It cannot improve performance if any of the shared resources are the limiting bottlenecks for the performance

27. What is the difference between symmetric and asymmetric multiprocessing?

Correct Answer: In symmetric multiprocessing, all processors are free to run any process in a system. In asymmetric multiprocessing, there is a master-slave relationship among the processors

28. What is the difference between uniform memory access (UMA) and non-uniform memory access (NUMA)?

Correct Answer: Uniform memory access amounts the same time for accessing any RAM from any processor. Non-uniform memory

access amounts longer time to access some part of memory than the other parts

29. What is the primary benefit of multithreading in a word processor?

Correct Answer: It allows the word processor to display graphics, respond to keystrokes, and continue spelling and grammar checking concurrently

30. What is the key difference between multiprocessing and multithreading?

Correct Answer: Multiprocessing allows a system to have more than two CPUs added to the system, whereas multithreading lets a process generate multiple threads to increase the computing speed of a system

31. What is the primary difference between the execution of processes in Multiprocessing and threads in Multithreading?

Correct Answer: Many processes are executed simultaneously in Multiprocessing, while many threads of a process are executed simultaneously in Multithreading.

32. Why is process creation in Multiprocessing considered time-consuming?

Correct Answer: Because it involves creating separate address spaces for each process.

33. What is the economic advantage of process creation in Multithreading compared to Multiprocessing?

Correct Answer: Process creation in Multithreading is more economical

because it involves sharing a common address space among threads.

34. How does the address space differ between processes in Multiprocessing and threads in Multithreading?

Correct Answer: Every process in Multiprocessing owns a separate address space, while in Multithreading, a common address space is shared by all the threads.

35. What is the key characteristic of Multiprocessing that makes it distinct from Multithreading in terms of address space?

Correct Answer: Each process in Multiprocessing has its own separate address space.

36. Explain the concept of a common address space in the context of Multithreading.

Correct Answer: In Multithreading, all threads share a common address space, which allows for efficient communication and data sharing.

37. What is the primary reason for the time-consuming nature of process creation in Multiprocessing?

Correct Answer: The need to allocate separate memory spaces for each process.

38. How does the sharing of a common address space in Multithreading contribute to its economic advantage?

Correct Answer: By reducing the overhead associated with creating

and managing separate memory spaces for each thread.

39. What is the implication of each process owning a separate address space in Multiprocessing?

Correct Answer: It ensures isolation between processes but increases the complexity and time required for process creation.

40. Compare the memory management strategies in Multiprocessing and Multithreading.

Correct Answer: In Multiprocessing, each process has its own memory space, while in Multithreading, all threads share the same memory space.

41. Parallelism always increases the performance of computer architectures?

a. True
b. False

Correct Answer: False

42. Multiprocessors are always more cost-effective than high-performance single processors?

a. True
b. False

Correct Answer: True

43. Fault tolerance is not an advantage of multiprocessors?

- a. True
- b. False

Correct Answer: False

44. Parallel processing systems can carry out simultaneous data-processing to achieve faster execution time?

- a. True
- b. False

Correct Answer: True

45. The primary purpose of parallel processing is to enhance the computer processing capability and increase its throughput?

- a. True
- b. False

Correct Answer: True

46. Bit-level parallelism is based on the decreasing processor's size?

- a. True
- b. False

Correct Answer: False

47. Instruction-level parallelism involves re-ordering and grouping instructions that are executed concurrently?

- a. True
- b. False

Correct Answer: True

48. Task parallelism employs the decomposition of a task into subtasks and then allocating each of the subtasks for execution concurrently?

- a. True
- b. False

Correct Answer: True

49. Data-level parallelism is limited by regular data manipulation patterns and by memory bandwidth?

- a. True
- b. False

Correct Answer: False

50. The best performance in parallel computing is achieved by an intermediate action plan that uses resources to utilize a degree of parallelism and a degree of locality?

- a. True
- b. False

Correct Answer: True

51. In the mid-80s, microprocessor-based computers had separate hardware for integer arithmetic, floating point operations, memory operations, and branch operations on a single chip?

- a. True
- b. False

Correct Answer: True

52. Super scalar execution fetches and executes one instruction at a time.

- a. True
- b. False

Correct Answer: False

53. Flynn's taxonomy classifies parallel computer architectures based on the

number of concurrent instruction and data streams.

- a. True
- b. False

Correct Answer: True

54. SISD systems are capable of executing multiple instructions on a single data stream.

- a. True
- b. False

Correct Answer: False

55. SIMD systems are well suited for scientific computing due to their ability to handle vector and matrix operations.

- a. True
- b. False

Correct Answer: True

56. MISD systems are commercially available and widely used.

- a. True
- b. False

Correct Answer: False

57. In MIMD systems, each processing element has separate instruction and data streams.

- a. True
- b. False

Correct Answer: True

58. Shared memory MIMD systems use an interconnection network for communication between processing elements.

- a. True
- b. False

Correct Answer: False

59. Vector architectures support a vector data type, which is a collection of VL n-bit words.

- a. True
- b. False

Correct Answer: True

60. Multithreading is a form of parallel architecture.

- a. True
- b. False

Correct Answer: False

61. A process switch always invokes the operating system?

- a. True
- b. False

Correct Answer: True

62. Coarse-grained multithreading switches between threads after every instruction?

- a. True
- b. False

Correct Answer: False

63. Fine-grained multithreading can hide latency within a thread?

- a. True
- b. False

Correct Answer: True

64. Simultaneous multithreading (SMT) switches resources every cycle?

- a. True
- b. False

Correct Answer: False

65. Multiprocessing systems always have more than two processors?

- a. True
- b. False

Correct Answer: True

66. In symmetric multiprocessing, all processors can run any process in the system?

- a. True
- b. False

Correct Answer: True

67. Non-uniform memory access (NUMA) takes the same time to access any RAM from any processor?

- a. True
- b. False

Correct Answer: False

68. Multithreading increases the computing speed of the system?

- a. True
- b. False

Correct Answer: False

69. A thread of a process has its own program counter and stack?

- a. True
- b. False

Correct Answer: True

70. Multiprocessing systems execute multiple threads of a process simultaneously?

- a. True
- b. False

Correct Answer: False

71. Multiprocessing involves the simultaneous execution of many threads of a process?

- a. True
- b. False

Correct Answer: False

72. Multithreading involves the simultaneous execution of many processes?

- a. True
- b. False

Correct Answer: False

73. Process creation in multithreading is more time-consuming than in multiprocessing?

- a. True
- b. False

Correct Answer: False

74. In multiprocessing, each process has its own separate address space?

- a. True
- b. False

Correct Answer: True

75. In multithreading, all threads share a common address space?

- a. True
- b. False

Correct Answer: True

76. Multiprocessing is generally more economical in terms of process creation compared to multithreading?

- a. True
- b. False

Correct Answer: False

77. Multithreading allows for more efficient use of CPU resources by sharing the same address space among threads?

- a. True
- b. False

Correct Answer: True

78. In multiprocessing, the creation of new processes is a quick and efficient operation?

- a. True
- b. False

Correct Answer: False

79. Multiprocessing and multithreading can both achieve concurrent execution of tasks, but they do so in fundamentally different ways?

- a. True
- b. False

Correct Answer: True

80. Multithreading is always more efficient than multiprocessing in terms of resource utilization?

- a. True
- b. False

Correct Answer: False

81. What is the primary goal of parallelism in computer architecture?

- a. To reduce power consumption
- b. To increase the number of instructions
- c. To enhance computational speed
- d. To decrease the size of the processor

Correct Answer: To enhance computational speed

82. Which of the following is NOT a type of parallelism?

- a. Bit-level parallelism
- b. Instruction-level parallelism
- c. Task parallelism
- d. Data-level parallelism

Correct Answer: Data-level parallelism

83. What is the main advantage of using multiprocessors?

- a. Increased power consumption
- b. Reduced fault tolerance
- c. Higher cost-effectiveness
- d. Slower speed

Correct Answer: Higher cost-effectiveness

84. Which of the following is a potential issue in parallel programming?

- a. Data races

- b. Increased determinism
- c. Improved liveness
- d. Enhanced synchronization

Correct Answer: Data races

85. What is the primary purpose of parallel processing?

- a. To decrease computational speed
- b. To enhance computer processing capability
- c. To reduce the number of functional units
- d. To increase the size of the processor

Correct Answer: To enhance computer processing capability

86. Which of the following is a form of parallel computing based on increasing processor size?

- a. Instruction-level parallelism
- b. Task parallelism
- c. Bit-level parallelism
- d. Data-level parallelism

Correct Answer: Bit-level parallelism

87. What is the main challenge in achieving optimal parallel program performance?

- a. Lack of communication
- b. Excessive synchronization
- c. Communication and synchronization between subtasks
- d. Increased determinism

Correct Answer: Communication and synchronization between subtasks

88. Which of the following is a benefit of parallel computing over serial computing?

- a. Increased time and cost
- b. Better utilization of hardware
- c. Reduced fault tolerance
- d. Slower execution time

Correct Answer: Better utilization of hardware

89. What is the role of synchronization in parallel programming?

- a. To increase non-determinism
- b. To control access to shared resources
- c. To reduce concurrency
- d. To eliminate data races

Correct Answer: To control access to shared resources

90. Which of the following is a characteristic of a multiprocessor system?

- a. It is less cost-effective than a high-performance single processor
- b. It provides continued service even if a processor fails
- c. It is slower than the fastest single-processor system
- d. It does not support fault tolerance

Correct Answer: It provides continued service even if a processor fails

91. What are the components of a microprocessor-based computer in the mid-80s?

- a. Integer processing unit, floating-point unit, cache controller, SRAMs for the cache data, tag storage
- b. Integer processing unit, floating-point unit, cache controller, DRAMs for the cache data, tag storage
- c. Integer processing unit, floating-point unit, cache controller, SRAMs for the cache data, tag storage, GPU
- d. Integer processing unit, floating-point unit, cache controller, SRAMs for the cache data, tag storage, ALU

Correct Answer: Integer processing unit, floating-point unit, cache controller, SRAMs for the cache data, tag storage

92. What is the term for the type of instruction level parallelism where multiple instructions are fetched at a time and sent in parallel to different functional units?

- a. Pipelining
- b. Super scalar execution
- c. Vector processing
- d. Multithreading

Correct Answer: Super scalar execution

93. Which of the following is NOT a classification method for parallel computers?

- a. Flynn
- b. Feng
- c. Handler
- d. RISC

Correct Answer: RISC

94. In Flynn's taxonomy, what does MISD stand for?

- a. Multiple instruction, single data
- b. Multiple instruction, multiple data
- c. Single instruction, single data
- d. Single instruction, multiple data

Correct Answer: Multiple instruction, single data

95. What is the primary limitation of the SISD model?

- a. The speed of the processing element is limited by the rate at which the computer can transfer information internally
- b. The speed of the processing element is limited by the rate at which the computer can process data externally
- c. The speed of the processing element is limited by the rate at which the computer can process instructions externally
- d. The speed of the processing element is limited by the rate at which the computer can process data internally

Correct Answer: The speed of the processing element is limited by the rate at which the computer can transfer information internally

96. Which of the following is a dominant representative of SIMD systems?

- a. IBM PC
- b. Cray's vector processing machine

- c. Silicon Graphics machines
- d. Sun/IBM's SMP

Correct Answer: Cray's vector processing machine

97. What is the primary characteristic of MIMD machines?

- a. Each PE has separate instruction and data streams
- b. Each PE shares the same instruction and data streams
- c. Each PE has separate instruction streams but shares the same data streams
- d. Each PE shares the same instruction streams but has separate data streams

Correct Answer: Each PE has separate instruction and data streams

98. In a shared memory MIMD model, how do PEs communicate with each other?

- a. Through the shared memory
- b. Through the interconnection network
- c. Through the global memory
- d. Through the local memory

Correct Answer: Through the shared memory

99. What is the primary advantage of vector load/store instructions?

- a. They provide the ability to do strided and scatter/gather memory accesses
- b. They provide the ability to do sequential and gather memory accesses
- c. They provide the ability to do strided and sequential memory accesses

- d. They provide the ability to do scatter/gather and sequential memory accesses

Correct Answer: They provide the ability to do strided and scatter/gather memory accesses

100. What is the primary purpose of hardware multithreading?

- a. Increasing utilization of a processor by switching to another thread when one thread is stalled
- b. Increasing utilization of a processor by switching to another thread when one thread is completed
- c. Increasing utilization of a processor by switching to another thread when one thread is paused
- d. Increasing utilization of a processor by switching to another thread when one thread is resumed

Correct Answer: Increasing utilization of a processor by switching to another thread when one thread is stalled

101. What is the primary difference between a process switch and a thread switch?

- a. A process switch always invokes the operating system, while a thread switch does not.
- b. A thread switch always invokes the operating system, while a process switch does not.

- c. Both a process switch and a thread switch always invoke the operating system.
- d. Neither a process switch nor a thread switch invokes the operating system.

Correct Answer: A process switch always invokes the operating system, while a thread switch does not.

102. Which type of multithreading switches between threads only after significant events such as a last-level cache miss?

- a. Fine-grained Multithreading
- b. Simultaneous Multithreading
- c. Coarse-grained Multithreading
- d. Dynamic Multithreading

Correct Answer: Coarse-grained Multithreading

103. What is a key advantage of Fine-grained Multithreading?

- a. It has very fast thread switching.
- b. It eliminates vertical waste.
- c. It is less expensive than coarse-grained multithreading.
- d. It does not slow down the execution of individual threads.

Correct Answer: It eliminates vertical waste.

104. What is the primary disadvantage of Simultaneous Multithreading (SMT)?

- a. It cannot improve performance if any of the shared resources are the

limiting bottlenecks for the performance.

- b. It is expensive than coarse-grained multithreading.
- c. It slows down the execution of individual threads.
- d. It is hard to overcome throughput losses from shorter stalls.

Correct Answer: It cannot improve performance if any of the shared resources are the limiting bottlenecks for the performance.

105. What is the key insight that motivates Simultaneous Multithreading (SMT)?

- a. Multiple-issue processors often have more functional unit parallelism available than most single threads can effectively use.
- b. It is always executing instructions from multiple threads.
- c. It dynamically schedules functional units among multiple threads.
- d. It increases hardware design facility.

Correct Answer: Multiple-issue processors often have more functional unit parallelism available than most single threads can effectively use.

106. What is the primary difference between Symmetric Multiprocessing and Asymmetric Multiprocessing?

- a. In Symmetric Multiprocessing, all processors are free to run any

process in a system, while in Asymmetric Multiprocessing, there is a master-slave relationship among the processors.

- b. In Asymmetric Multiprocessing, all processors are free to run any process in a system, while in Symmetric Multiprocessing, there is a master-slave relationship among the processors.
- c. Both Symmetric and Asymmetric Multiprocessing have the same processor relationships.
- d. Symmetric Multiprocessing has a master-slave relationship, while Asymmetric Multiprocessing does not.

Correct Answer: In Symmetric Multiprocessing, all processors are free to run any process in a system, while in Asymmetric Multiprocessing, there is a master-slave relationship among the processors.

107. What happens to the memory access model when a processor with an integrated memory controller is added to a system?
- a. It changes from Non-Uniform Memory Access (NUMA) to Uniform Memory Access (UMA).
 - b. It changes from Uniform Memory Access (UMA) to Non-Uniform Memory Access (NUMA).
 - c. It remains the same.
 - d. It changes to a hybrid model.

Correct Answer: It changes from Uniform Memory Access (UMA) to Non-Uniform Memory Access (NUMA).

108. What is the primary benefit of multithreading in a word processor?
- a. It allows the word processor to display graphics, respond to keystrokes, and continue spelling and grammar checking concurrently.
 - b. It increases the computing speed of the system.
 - c. It adds more number of CPUs/processors to the system.
 - d. It allows the word processor to open different instances for each task.

Correct Answer: It allows the word processor to display graphics, respond to keystrokes, and continue spelling and grammar checking concurrently.

109. What is the primary advantage of creating threads over creating separate processes?
- a. Creating threads is more economical as it shares the code and data of the process to which they belong.
 - b. Creating threads consumes more time and exhausts system resources.
 - c. Creating threads does not increase responsiveness.
 - d. Creating threads does not allow resource sharing.

Correct Answer: Creating threads is more economical as it shares the

code and data of the process to which they belong.

110. What is the key difference between multiprocessing and multithreading?
- a. Multiprocessing allows a system to have more than two CPUs added to the system, while multithreading lets a process generate multiple threads to increase the computing speed of a system.
 - b. Multiprocessing lets a process generate multiple threads, while multithreading allows a system to have more than two CPUs added to the system.
 - c. Both multiprocessing and multithreading have the same key difference.
 - d. Multiprocessing and multithreading are the same concept.

Correct Answer: Multiprocessing allows a system to have more than two CPUs added to the system, while multithreading lets a process generate multiple threads to increase the computing speed of a system.

111. What is the primary difference between multiprocessing and multithreading in terms of execution?
- a. Multiprocessing executes one process at a time, while multithreading executes multiple threads sequentially.
 - b. Multiprocessing executes multiple processes simultaneously, while multithreading executes

multiple threads of a process simultaneously.

- c. Multiprocessing and multithreading are the same in terms of execution.
- d. Multiprocessing executes threads, while multithreading executes processes.

Correct Answer: Multiprocessing executes multiple processes simultaneously, while multithreading executes multiple threads of a process simultaneously.

112. Which of the following is true about process creation in multiprocessing?

- a. Process creation is instantaneous.
- b. Process creation is economical.
- c. Process creation is a time-consuming process.
- d. Process creation is not necessary.

Correct Answer: Process creation is a time-consuming process.

113. What is the characteristic of process creation in multithreading?

- a. Process creation is time-consuming.
- b. Process creation is not economical.
- c. Process creation is instantaneous.
- d. Process creation is economical.

Correct Answer: Process creation is economical.

114. In multiprocessing, how is the address space managed for each process?

- a. Each process shares a common address space.
- b. Each process owns a separate address space.
- c. Address space is not managed.
- d. Address space is managed by the operating system only.

Correct Answer: Each process owns a separate address space.

115. What is the address space management strategy in multithreading?

- a. Each thread owns a separate address space.
- b. A common address space is shared by all the threads.
- c. Address space is not managed.
- d. Address space is managed by the user.

Correct Answer: A common address space is shared by all the threads.

116. Which of the following statements is true about the relationship between processes and address space in multiprocessing?

- a. Each process shares a common address space.
- b. Each process owns a separate address space.
- c. Processes do not have an address space.
- d. Address space is managed by the threads.

Correct Answer: Each process owns a separate address space.

117. In multithreading, how is the address space utilized by the threads?

- a. Each thread has its own address space.
- b. Threads do not utilize address space.
- c. A common address space is shared by all the threads.
- d. Address space is managed by the processes.

Correct Answer: A common address space is shared by all the threads.

118. What is the primary advantage of multiprocessing in terms of address space?

- a. Shared address space reduces complexity.
- b. Separate address space increases isolation.
- c. Address space is not an advantage.
- d. Address space is managed by the threads.

Correct Answer: Separate address space increases isolation.

119. Which of the following is a disadvantage of multithreading in terms of address space?

- a. Shared address space increases complexity.
- b. Separate address space reduces isolation.
- c. Address space is not a disadvantage.
- d. Address space is managed by the processes.

Correct Answer: Shared address space increases complexity.

120. What is the key difference between multiprocessing and multithreading in terms of resource management?

- a. Multiprocessing uses more resources due to separate address spaces.
- b. Multithreading uses more resources due to shared address spaces.
- c. Both use the same amount of resources.
- d. Resource management is not a factor.

Correct Answer: Multiprocessing uses more resources due to separate address spaces.

