

Kasdi Merbah University – OUARGLA
Faculty of New Information and Communication Technologies (FNTIC)
Department of Computer Science and Information Technologies



Exam (Semester 1)
-MASTER 2 - Fundamental Computer Science

Course: Parallel Architectures
Duration: 1 hour and 30 minutes
(No authorized documents)

- 1) Which of the following is a characteristic of the Von Neumann architecture?
 1. Separate data and instruction buses
 2. **Single unified memory for data and instructions**
 3. Harvard architecture with separate memory spaces
 4. Parallel processing units

- 2) In Harvard architecture, what is the main advantage of having separate memory spaces for data and instructions?
 1. Simplified control unit
 2. **Faster access to instructions**
 3. Reduced power consumption
 4. Improved parallel processing

- 3) Which architecture allows simultaneous access to data and instructions, potentially speeding up processing?
 1. Von Neumann architecture
 2. **Harvard architecture**
 3. RISC architecture
 4. CISC architecture

- 4) Flynn's taxonomy is commonly used to classify:
 1. Operating systems
 2. Programming languages
 3. **Parallel processing systems**
 4. Networking protocols

- 5) SISD architecture is typically associated with:
 1. Vector processors
 2. SIMD processors
 3. **Sequential processing**
 4. Multiprocessor systems

6) What is the primary limitation of SISD architecture in terms of performance?

1. **Lack of parallelism**
2. High power consumption
3. Complexity of design
4. Limited memory capacity

7) In SIMD architecture, how many processing units are there?

1. One
2. Two
3. **Multiple**
4. None

8) In MISD architecture, how many processing units are there?

1. One
2. Two
3. **Multiple**
4. None

9) SIMD architecture is often associated with:

1. **Vector processors**
2. SISD processors
3. Sequential processing
4. Multiple control units

10) What term is often used to describe the execution flow in SIMD systems?

1. Pipelining
2. Parallelism
3. Concurrency
4. **Vectorization**

11) Which of the following is an example of an MIMD system?

1. **Multi-core processor**
2. SIMD processor
3. GPU
4. MISD processor

12) Which of the following about OpenMP is incorrect?

1. OpenMP is an API that enables explicit multi-threaded parallelism
2. The primary components of OpenMP are compiler directives, runtime library, and environment variables
3. OpenMP implementations exist for the Microsoft Windows platform
4. **OpenMP is designed for distributed memory parallel systems and guarantees efficient use of memory**

13) Code in an OpenMP program that is not covered by a pragma is executed by how many threads?

1. **Single thread**
2. Two threads
3. All threads

14) What does the MPI_Finalize function do in MPI?

1. **Finalize the MPI environment and terminate the program**
2. Finalize a specific MPI communicator
3. Free memory allocated by MPI
4. Finalize the MPI library

15) What does MPI_COMM_WORLD represent in MPI?

1. A specific communicator
2. **The entire MPI world**
3. World Communication Interface
4. World Communication Network

16) What is printed when executing the below code?

```
int a = 5;
int b = 23;
int c = -3;
#pragma omp parallel num_threads(4) private(a) reduction(+:c)
{
    int d = omp_get_thread_num();
    a = 4 + d;
    #pragma omp critical
    b = 2;
    c += a + b;
}
c = c / 2;
printf("a=%d, b=%d, c=%d\n", a, b, c);
```

Answer : a=5 ; b=2 ; c=20

17) What is the output of the following program?

```
#pragma omp parallel num_threads(3)
{
    #pragma omp single
    printf("read input\n");
    printf("compute results\n");
    #pragma omp single
    Printf("write output\n");
}
```

Answer : read input, compute results, compute results, compute results, write output

18) What is the output of the following program (We assume that we have 2 threads)?

```
int count = 0;
#pragma omp parallel for firstprivate(count)
for (int i = 0; i < 2; i++) {
    count += 1;
    printf("NT=%d, C=%d\n", omp_get_thread_num(), count);
}
printf(count);
```

Answer : NT=1, C=1 NT=1, C=2 NT=2, C=1 NT=2, C=2 0

19) What is the output of the following program (We assume that we have 4 threads)?

```
printf("A\n");
#pragma omp parallel if(0)
{
    printf("B\n");
}
printf("C\n");
```

Answer : A C

20) What is the output of the following program (We assume that we have 4 threads)?

```
MPI_Init(NULL, NULL);
int rank, size, data;
MPI_Comm_rank(MPI_COMM_WORLD, &rank);
MPI_Comm_size(MPI_COMM_WORLD, &size);
if (rank == 0) {
    data = 22;
}
MPI_Bcast(&data, 1, MPI_INT, 0, MPI_COMM_WORLD);
printf("R %d D: %d\n", rank, data);
MPI_Finalize();
```

Answer

R 0 D: 22

R 1 D: 22

R 2 D: 22

R 3 D: 22