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)

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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);
```

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");
}
```

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);
```

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");
```

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();
```