

→ ⚠ Moving to another question will save this response.

Question 1

In _____, multiple functional units are arranged in stages to simultaneously execute instructions.

- pipelining
- virtual memory
- ILP
- multiple issue

Question 2

```
int my_rank, comm_sz;
double start, finish, elapsed_time, max_elapsed_time;
MPI_Init(NULL, NULL);
MPI_Comm_rank(MPI_COMM_WORLD, &my_rank);
MPI_Comm_size(MPI_COMM_WORLD, &comm_sz);

//A- to ensure that all processes have been reached this point
.....
//B- to measure the current time in the MPI
start = .....
Parallel_sum();
//C- to measure the current time in the MPI
finish = .....
elapsed_time = finish - start;

MPI_Reduce(&elapsed_time, &max_elapsed_time, 1, MPI_DOUBLE, MPI_MAX, 0, MPI_COMM_WORLD);

if (my_rank == 0) {
    printf("Elapsed time: %f", max_elapsed_time);
}
MPI_Finalize();
```

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```
a: MPI_Barrier(MPI_comm MPI_COMM_WORLD);
b: MPI_Wtime();
c: MPI_
```

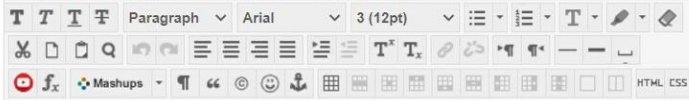
Question 3

Write an openMP program that calculate the **factorial** of a given number using *parallel for* directive and *reduction* clause:

Hint: $factorial(n) = 1 * 2 * 3 * \dots * n$

e.g.: $factorial(4) = 1 * 2 * 3 * 4$

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Path: p

Question 4

GPU is often optimize performance by using _____ parallelism.

- SIMD
- MIMD
- SISD
- MISD

Question 5

When we run an MPI program several times with the same input, the same number of processes, and the same system, we expect the output to have _____.

- Decreasing run times.
- Exactly the same run times.
- Increasing run times.
- Substantial variation in the times.

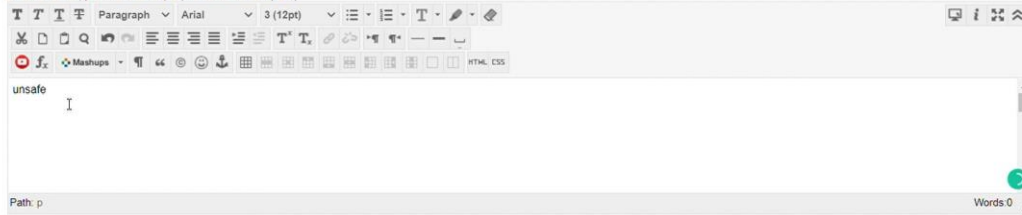
Question 6

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Answer the following:

A program that relies on MPI-provided buffering is said to be _____

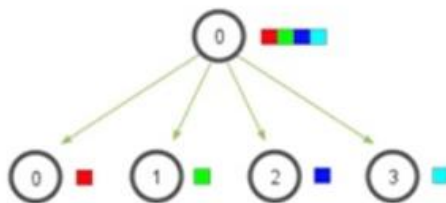
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The image shows a rich text editor interface. The toolbar includes options for text formatting (bold, italic, underline, strikethrough), paragraph alignment (left, center, right, justified), list creation, link insertion, and image insertion. The text area contains the word "unsafe" followed by a cursor. The bottom status bar shows "Path: p" and "Words 0".

Question 7

Which of the following MPI functions does the operation as in the figure.



- MPI_Bcast
- MPI_Scatter
- MPI_Gather
- MPI_Reduce

Question 8

In OpenMP, a collection of threads executing the parallel block is called _____.

- Slave-threads.
- Master-threads.
- Team.
- Processes.

Question 9

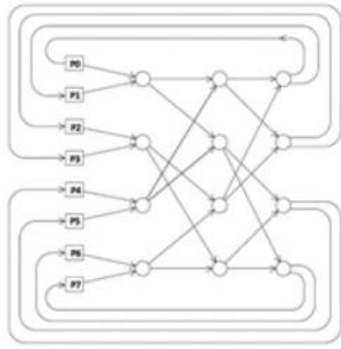
Based on Flynn's Taxonomy, a classical von Neumann system is considered _____.

- MIMD
- SIMD
- MISD
- SISD

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Question 10

Based on the given figure, which of the following statement is true.



- When P0 communicates with P6, P1 can simultaneously communicate with P7
- When P0 communicates with P6, P4 cannot simultaneously communicate with P2
- All processors are able to communicate with each other simultaneously.
- When P0 communicates with P6, P1 cannot simultaneously communicate with P7

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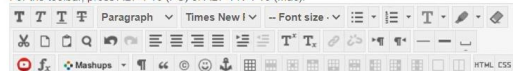
Question 11

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Answer the following:

Given the following information (*run time of serial program = 80 seconds, run time of parallel program = 10 seconds, data size = 1000, number of processes = 4*), What is the efficiency of the parallel program?

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efficiency = speedup/p x parallel

~~$80/(4 \times 10) = 2$~~ $80/(4 \times 10) = 80/40 = 2$

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Question 12

In OpenMP, the directive that prevents the race condition problem is _____.

- parallel for
- critical
- reduction
- parallel

Question 13

Which of the following OpenMP functions is used to find the number of threads?

- omp_get_num()
- omp_get_num_threads ()
- omp_get_thread_num ()
- num_threads()

Question 14

UMA: Connect all the processors directly to main memory
Answer the following: *NUMA: Each processor have a direct connection to a block of main memory*

Explain the difference between UMA and NUMA multicore systems.

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UMA: Time to access all the memory locations will be the same for all the cores.

NUMA: A memory location a core is directly connected to can be accessed faster than a memory location that must be accessed through another chip.

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Question 15

Suppose that there are 3 variables stored in the memory; x, y and z. Determine the values of the displacement for array_of_displacement[[]].

Variables	Types	Address
x	Integer	22
y	double	44
z	double	56

- {100, 80, 20}
- {0, 22, 12}
- {0, 22, 34}
- {100, 180, 200}

Question 16

Answer the following:

List two types of the cyclic scheduling?



static, dynamic, Guided, Auto, Runtime



Question 17

The system in which multiple processors communicate implicitly by accessing shared data structures is _____.

- Shared-memory System
- Distributed-memory System
- Clusters
- Vector processors

Question 18

In MPI, point-to-point communications are matched on the basis of _____

- Tags only.
- Data type.
- Communicator only.
- Tags and communicators.

Question 19

Answer the following:

Name two main approaches of Instruction Level **Parallelism** (ILP).

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pipelining

multiple issu