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Marks 18.00/18.00

Grade 100.00 out of 100.00

Question 1

Correct

Mark 1.00 out of 1.00

Which of the following is not a Shared Memory Programming library/interface?

Select one:

- ☐ a. TBB
- ☐ b. OpenMP
- ☒ c. MPI ✓
- ☐ d. CILK

The correct answer is: MPI

Question 2

Correct

Mark 1.00 out of 1.00

In Pthreads if a thread tid1 was created via a fork command, then in order to synchronize and wait for it to finish you have to do

Select one:

- ☐ a. coend tid1
- ☒ b. join tid1 ✓
- ☐ c. barrier tid1
- ☐ d. wait tid1

The correct answer is: join tid1

Question 3

Correct

Mark 1.00 out of
1.00

The reason why it's not a good idea to create a different thread in Pthreads for each element of a large 2d array is

Select one:

- ☐ a. a program in Pthreads cannot create more threads than the number of physical cores
- ☐ b. code will not compile
- ☐ c. it can create deadlock upon thread execution
- ☒ d. thread overhead will be very high ✓

The correct answer is: thread overhead will be very high

Question 4

Correct

Mark 1.00 out of
1.00

The type of a thread_id as required by pthread_create is

Select one:

- ☒ a. pthread_t ✓
- ☐ b. bool
- ☐ c. long int
- ☐ d. int

The correct answer is: pthread_t

Question 5

Correct

Mark 1.00 out of
1.00

A barrier in Pthreads can

Select one:

- ☐ a. synchronize to wait on 1,2 or all threads
- ☒ b. synchronize to wait on any specific number of threads , also all ✓
- ☐ c. only synchronize between threads declared in the same array of pthread_t
- ☐ d. only synchronize between all threads

The correct answer is: synchronize to wait on any specific number of threads , also all

Question 6

Correct

Mark 1.00 out of 1.00

The name used for a lock within Pthreads is

Select one:

- ☐ a. lock
- ☒ b. mutex ✓
- ☐ c. semaphore
- ☐ d. mux

The correct answer is: mutex

Question 7

Correct

Mark 1.00 out of 1.00

Semaphores are

Select one:

- ☐ a. a normal type of lock in Pthreads
- ☒ b. generalized locks that allow k threads to access them ✓
- ☐ c. locks that automatically release after a set time to avoid deadlock
- ☐ d. locks that prevent the memory accessed by a thread holding a lock from being accessed by any other thread

The correct answer is: generalized locks that allow k threads to access them

Question 8

Correct

Mark 1.00 out of 1.00

Transactional memory is

Select one:

- ☐ a. the part of shared memory that is assigned for thread data structures and overhead
- ☐ b. the memory used by cache coherency protocols to keep directories of updated values and locations
- ☐ c. an attempt at fast shared memory for use by locks, barriers and other shared memory constructions
- ☒ d. an attempt to implement locks for certain memory locations using extra hardware resources ✓

The correct answer is: an attempt to implement locks for certain memory locations using extra hardware resources

Question 9

Correct

Mark 1.00 out of 1.00

The main programming constructs in the OpenMP language are

Select one:

- ☐ a. library calls
- ☐ b. assembly instructions
- ☒ c. compiler directives ✓
- ☐ d. environment calls

The correct answer is: compiler directives

Question 10

Correct

Mark 1.00 out of 1.00

Which of the following is not easily achieved in converting a code to OpenMP?

Select one:

- ☐ a. synchronization across all threads
- ☐ b. easy split of program into serial and parallel regions
- ☐ c. little code modification
- ☒ d. freedom from data races ✓

The correct answer is: freedom from data races

Question 11

Correct

Mark 1.00 out of 1.00

In OpenMP dynamic allocation for loop scheduling should be used

Select one:

- ☒ a. whenever the work being done has large variations in execution time and have reasonably small amounts of work ✓
- ☐ b. always
- ☐ c. whenever the work being done has small variations but have large amounts of work
- ☐ d. whenever the work being done has large variations in execution time and have very large amounts of work

The correct answer is: whenever the work being done has large variations in execution time and have reasonably small amounts of work

Question 12

Correct

Mark 1.00 out of 1.00

How does one create a parallel region in OpenMP (where each thread executes a copy of the code within the region)?

Select one:

- ☒ a. `#pragma omp parallel` ✓
- ☐ b. `#pragma omp for`
- ☐ c. `#pragma omp task`
- ☐ d. `#pragma opm critical`

Your answer is correct.

The correct answer is: `#pragma omp parallel`

Question 13

Correct

Mark 1.00 out of 1.00

In the OpenMP/Pthreads data comparison presented, the likely cause for poor performance with Pthreads on the smaller ocean was

Select one:

- ☐ a. non-minimization of surface-to-volume ratio
- ☐ b. OpenMP's superior range of available shared memory options
- ☐ c. Pthreads likely implementation consisted of OpenMP commands that weren't optimised as well as they could have been
- ☒ d. thread creation overhead ✓

The correct answer is: thread creation overhead

Question 14

Correct

Mark 1.00 out of 1.00

In order to have a single-thread region within a parallel OpenMP region we can use which construct below?

Select one:

- ☐ a. `#pragma omp critical`
- ☐ b. `#pragma omp parallel`
- ☐ c. `#pragma omp barrier`
- ☒ d. `#pragma omp master` ✓

The correct answer is: `#pragma omp master`

Question 15

Correct

Mark 1.00 out of
1.00

A 'critical section' in OpenMP is similar to which concept of shared memory programming

Select one:

- ☒ a. lock ✓
- ☐ b. fork/join
- ☐ c. semaphore
- ☐ d. barrier

The correct answer is: lock

Question 16

Correct

Mark 1.00 out of
1.00

When does false sharing happen?

Select one:

- ☐ a. when a single thread writes to memory locations that are far away from each other
- ☐ b. when multiple threads write to the same exact memory location
- ☒ c. when multiple threads write to different but nearby memory locations that fall on the same cache line ✓
- ☐ d. when multiple threads write to memory locations that are far away from each other

Your answer is correct.

The correct answer is: when multiple threads write to different but nearby memory locations that fall on the same cache line

Question 17

Correct

Mark 1.00 out of 1.00

Mark all methods that are used to **efficiently** eliminate false sharing that occurs when accessing a shared array

Select one or more:

- ☐ a. Run that region of the code using a single thread only
- ☒ b. Pad the array so that elements accessed by multiple threads fall on distinct cache lines. ✓
- ☒ c. Use thread local variables instead of a shared array ✓
- ☐ d. Disable the cache coherence protocol.

Your answer is correct.

The correct answers are: Pad the array so that elements accessed by multiple threads fall on distinct cache lines., Use thread local variables instead of a shared array

Question 18

Correct

Mark 1.00 out of 1.00

OpenMP's flush (#omp pragma flush) operator forces data to be updated in memory so other threads see the most recent value. Flush itself is not a synchronization primitive, however some OpenMP synchronization primitives imply a flush. Mark all OpenMP synchronization primitives that imply a flush.

Select one or more:

- ☒ a. entry/exit of critical regions ✓
- ☐ b. entry to worksharing regions (i.e. #omp pragma for)
- ☒ c. whenever a lock is set or unset ✓
- ☒ d. implicit and explicit barriers ✓
- ☒ e. entry/exit of parallel regions ✓

Your answer is correct.

The correct answers are:
entry/exit of parallel regions
, implicit and explicit barriers, entry/exit of critical regions, whenever a lock is set or unset