

27. a. Apply the various steps available to improve the performance of the code by optimizing the loops using suitable examples. 10 3 2 2

(OR)

- b. Evaluate the role of compilers in optimizing the serial code of the high performance computers. 10 4 2 2

28. a. Investigate the working of switched and fat-tree networks in parallel computing paradigm. 10 4 3 3

(OR)

- b. Analyze the possible ways in integrating the cache coherence mechanism with cache based microprocessors systems. 10 4 4 3

29. a. Apply the working of wave-front parallelization in any high performance computing paradigm to identify the logic of advance open MP. 10 3 5 4

(OR)

- b. Investigate the steps involved in solving the synchronization problems using critical regions with open MP by a suitable example. 10 4 5 5

30. a. Examine the operation of synchronization and implicit serialization in order to deliver an efficient MPI programming. 10 4 6 5

(OR)

- b. Analyze how non-blocking point to point communication takes place in a distributed memory parallel programming with MPI. 10 4 6 5

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Reg. No.

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022

Sixth/ Seventh Semester

18CSE454T – HIGH PERFORMANCE COMPUTING

(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours

Max. Marks: 75

PART – A (25 × 1 = 25 Marks)

Answer **ALL** Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 1. Control and arithmetic units together with the appropriate interfaces to memory and I/O are called
(A) Graphics processing unit (B) Central processing unit
(C) Basic input output system (D) Memory unit | 1 | 2 | 1 | 1 |
| 2. All the components of a CPU core can operate at some maximum speed called
(A) Peak performance (B) Good performance
(C) Weak performance (D) Average performance | 1 | 2 | 1 | 5 |
| 3. The performance at which the FP units generate results for multiply and add operations is measured in
(A) Machine instruction per second (B) Accurate point operations per second
(C) Floating-point operations per second (D) Integer operations per second | 1 | 1 | 1 | 5 |
| 4. Super scalarity is a special form of a parallel execution, and a variant of _____
(A) Instruction level parallelism (B) Data level parallelism
(C) Memory level parallelism (D) Bus level parallelism | 1 | 2 | 1 | 2 |
| 5. Writing a program so that the compiler can generate effective SIMP vector instructions is called
(A) Multitrack pipeline (B) Peak performance
(C) Polymorphism (D) Vectorization | 1 | 2 | 1 | 2 |
| 6. The most widely used profiling tool is a gprof from the GNU binutils package. gprof uses both instrumentation and sampling to collect a flat function profile as well as call graph profile, as called as
(A) Butterfly graph (B) Code instrumentation
(C) Sampling (D) Coloring graph | 1 | 2 | 2 | 3 |
| 7. Gathering information about a program's behavior, specifically its uses of resources is called
(A) Hotspots (B) Profiling
(C) Pipeline stalls (D) Sampling | 1 | 1 | 2 | 3 |

8. A number of iterations equal to the SIMD register size has to be executed as a single chunk without any branches in between and can pay off even without SIMD is called _____.
 (A) Loop rolling (B) Loop unrolling
 (C) Loop variant (D) Loop invariant
9. _____ occurs if the CPU does not have enough registers to hold all the required operands inside a complex computation or loop body
 (A) Register pressure (B) Memory pressure
 (C) Input pressure (D) Profiling
10. _____ will help with register optimizations since the optimizer can probably keep values in registers that would otherwise have to be written to memory before the functional and read back afterwards
 (A) Compiler logs (B) In lining
 (C) Computation accuracy (D) Aliasing
11. In uniform memory access latency and bandwidth are same for all processors and all memory locations this is called _____.
 (A) Symmetric multiprocessing (B) Asymmetric multiprocessing
 (C) Single data single instruction (D) Single instruction single data
12. In fat tree networks _____ selects data path depending on the network load and thus avoids collision
 (A) Adaptive routing (B) Non adaptive routing
 (C) Algorithmic routing (D) Switched routing
13. _____ systems memory is physically distributed but logically shared
 (A) ccNUMA (B) UMA
 (C) SIMD (D) MIMD
14. _____ systems exhibit a flat memory model in which latency and bandwidth are same for all processors and all memory locations
 (A) ccNUMA (B) UMA
 (C) SIMD (D) MIMD
15. In switched network, the maximum number of hops required to connect two arbitrary devices is called _____ of the network.
 (A) Bandwidth (B) Bisection bandwidth
 (C) Diameter (D) Crossbar
16. _____ threads are not a comfortable parallel programming model for most scientific software, which is typically loop centric.
 (A) Single (B) Multi
 (C) Posix (D) Variable
17. In data scoping, the index variable of a work-sharing loop is automatically made _____.
 (A) Public (B) Private
 (C) Available (D) Parallel

18. Concurrent write a read access enables the race condition _____ solves this problem.
 (A) Critical regions (B) Data scoping
 (C) Parallel execution (D) Concurrent execution
19. _____ clause minimizes the code without chaining the meaning in/open MP
 (A) Minimization (B) Reduction
 (C) Maximization (D) Random number
20. _____ of the Jacobi algorithm is straight forward because all updates of a sweep go to a different array?
 (A) Maximization (B) Parallelization
 (C) Threads (D) Critical regions
21. What is the name of the default communicator in MPI that defines a group of processes for parallel calculation?
 (A) MPI_comm (B) MPI_comm_world
 (C) MPI_comm_process (D) MPI_process
22. Identify the MPI functions that support the creation and handling of virtual topologies
 (A) MPI_cart_create () (B) MPI_coords ()
 (C) MPI_cart () (D) MPI_shift ()
23. What is the name of programming, by dedicating a separate thread to handle MPI calls while other thread execute user code?
 (A) Open MP programming (B) MPI programming
 (C) Hybrid programming (D) Integrated programming
24. Which of the following is used to shut down the parallel program in MPI?
 (A) MPI_Exit () (B) MPI_Shutdown ()
 (C) MPI_Finalize () (D) MPI_End ()
25. Which MPI functions supports the non-blocking point to point communication?
 (A) MPI_Send () (B) MPI_Ssend ()
 (C) MPI_Bsend () (D) MPI_Isend ()

PART – B (5 × 10 = 50 Marks)

Answer ALL Questions

26. a. Experiment the design principles of a vector processing using Y-track pipelines with a neat sketch.

(OR)

- b. Analyze the working of general purpose cache based microprocessor architecture. Illustrate with a block diagram.