ii.	Describe how the SIMD scales high in performance than the pipelining and super scalarity.	4	3	1	2
	(OR)				
b.	With a neat block diagram explain different variations of multicore processor architecture.	10	3	1	1
27. a.	Describe different scalar profiling techniques to optimize the code that run on multiprocessor and parallel computers.	10	3	2	2
	(OR)				
b.	Describe how the C++ compiler optimize the use of temporaries with an example.	10	4	2	2
28. a.	Describe and contrast the following				
	(i) Distributed memory computers	5	4	3	1
	(ii) Hybrid computers	5	4	3	1
	(OR)				
b.	Explain the different types of parallelism that can be used to compute large quantities of data and instructions of a computer to increase the performance of parallel computing.	10	4	4	2
29. a.i.	Summarize the parallel execution model of open MP in shared memory programming systems with the simple example program.	6	4	5	3
ii.	How data needed for the parallel program can be scoped in open MP? Give example.	4	3	5	2
	(OR)				
b.i.	Explain how to coordinate the access to shared resources to achieve serialization property.	5	3	5	2
ii.	What is false sharing? Explain the methods to handle the false sharing.	5	3	5	1
30. a.	Explain the distributed memory parallel programming using MPI with an example program.	10	4	6	2
	(OR)				
b.i.	Differentiate blocking and non-blocking communications. Also state for what kind of applications blocking and non-blocking.	4	3	6	3
ii.	List and explain how non-blocking point-to-point communications are supported using MPI with example.	6	4	6	3

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Reg. No.														

B.Tech. DEGREE EXAMINATION, MAY 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.	Identify the computing paradigm to which the Von Neumann computer belong? (A) Single instruction multiple data (B) Single instruction single data (C) Multiple instruction single data (D) Multiple instruction multiple data	1	1	1	1
2.	Name the process of performing fetch or decoding of different instruction during the execution of another instruction. (A) Super scalarity (B) Pipelining (C) Parallel computation (D) Serial computation	1	1	1	1
3.	From the following identify the situation that results when the cache lines are loaded into and evicted from the cache in rapid succession. (A) Cache mapping (B) Cache miss (C) Cache thrashing (D) Cache replacement	1	2	1	2
4.	In multicore architecture, the cores of chips are enclosed in a replacement physical package called? (A) Socket (B) Port (C) Box (D) Case	1	1	1	1
5.	Which component can be included to increase the speed of memory access to exploit the full benefit of throughput from pipelining? (A) Special memory location (B) Special purpose registers (C) Cache (D) Buffers	1	2	1	2
6.	What is the name of the part of the program that require the dominant fraction of runtime? (A) Critical region (B) Hot spot (C) Profile (D) Data access	1	1	2	2
7.	Which metric is used to find the percentage of overall program runtime used exclusively by a specific function? (A) Cumulative seconds (B) Self seconds (C) Self ms/call (D) %time	1	1	2	2

8. Name the optimizing technique that replaces the expressions that consumes more computing resources with cheaper expressions without compromising the output of expression. 1 2 2 2
   (A) Strength reduction (B) Code optimization
   (C) Code movement (D) Code elimination

9. The matrices in which the magnitude of the diagonal is greater than or equal to the sum of the magnitude of all other elements in that row is called? 1 2 2 2
   (A) Sparse matrices (B) Diagonal matrices
   (C) Diagonally sparse matrices (D) Diagonally dominant matrices

10. Which performance profiling method helps to identify which data items accessed in a complex piece of code actually cause the most delay? 1 1 2 3
   (A) Software performance counters (B) Hardware performance counters
   (C) Instrumentation (D) Sampling

11. Which metric is used to quantity the maximum aggregated communication capacity across the whole network? 1 1 3 3
   (A) Bisection bandwidth (B) Bottlenecks
   (C) Overhead (D) Network bandwidth

12. In parallel programming, the metric helpful in finding the speed, amount of work done, resource usage and communication overhead is called? 1 2 4 2
   (A) Performance metric (B) Bandwidth
   (C) Salability metric (D) Efficiency

13. In MESI protocol the state at which the cache line has been modified in this cache and resides in no other cache is called? 1 2 3 3
   (A) M-modified (B) E-Exclusive
   (C) S-shared (D) I-Invalid

14. Which routing selects data paths depending on the network load and thus avoids collisions? 1 2 3 3
   (A) Dynamic routing (B) Selective routing
   (C) Static routing (D) Adaptive routing

15. In switches network, which switches connect to the actual compute elements? 1 2 3 2
   (A) Spines (B) Switch port
   (C) Leaf switches (D) Cross bar

16. What is the name of the programming model used by openMP? 1 1 5 1
   (A) Message passing model (B) Fork-join model
   (C) Fork-pipe model (D) Inter-process model

17. How synchronization point can be set to guarantee that all the threads have reached it before any thread goes to execute other codes? 1 2 5 2
   (A) Lock (B) Reduction
   (C) Task (D) Barrier

18. Which clause is used to reduce the scope of parallel execution when serial code execution gives better performance? 1 2 5 3
   (A) If (B) Num_threads
   (C) Collapse (D) Reduction

19. Which scheduling best suits for the code with server memory bound loop and small cluster size? 1 2 5 3
   (A) Static (B) Dynamic
   (C) Guided (D) Random

20. Select the environment variable which is used to allow the active threads to change between the parallel regions at runtime to adapt to available system resources 1 1 5 3
   (A) OMP-RUNTIME (B) OMP_SCHEDULE
   (C) OMP-DYNAMIC (D) OMP_STACKSIZE

21. In distributed_memory parallel programming, how the different processes communicate with each other? 1 1 6 2
   (A) Pipes (B) Message passing
   (C) Inter-process communication (D) Function call

22. Which MPI collective function helps to send a message from one process to all other in the communicator? 1 2 6 2
   (A) MPI_GATHER (B) MPI_SEND
   (C) MPI_BCAST (D) MPI_ISEND

23. How the small message latency can be avoided when transmitting the small messages between the process? 1 1 6 2
   (A) Aggregating the messages (B) Scattering the messages
   (C) Broadcasting the messages (D) Gathering the messages

24. How the inter-processor communications within MPI are managed? 1 2 6 2
   (A) Sheared memory objects (B) Message buffers
   (C) Communicators and groups (D) Caches

25. Which of the following statements are incorrect with respect to MPI functions? 1 2 6 2
   (A) MPI_ISEND and MPI_IRECV are Non-blocking message passing functions of MPI
   (B) MPI_Issend and MPI_Ibsend are Non-blocking message passing functions of MPI
   (C) MPI_SEND and MPI_RECV are Non-blocking message passing functions of MPI
   (D) MPI_SSEND and MPI BSEND are blocking message passing functions on MPI

PART – B (5 × 10 = 50 Marks) Marks BL CO PO

Answer **ALL** Questions

26. a.i. Explain the advanced techniques to be adopted to improve the application performance from the complexity arises as stated by Moore's law. 6 3 1 1