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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (2025 - 2026)

Subject: High Performance Computing

Time: 3 Hours

Max. Marks: 70

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

15

1. Attempt all parts:-

- | | | |
|-------|--|---|
| (1.1) | In shared memory systems, processors communicate via. (CO1, K1) | 1 |
| | (a) Network cables | |
| | (b) Shared variables in memory | |
| | (c) Email | |
| | (d) Flash drives | |
| (1.2) | A type of parallelism that uses micro architectural techniques. (CO2, K1) | 1 |
| | (a) instructional | |
| | (b) bit level | |
| | (c) bit based | |
| | (d) increasing | |
| (1.3) | ___ algorithms use auxiliary storage (such as tapes and hard disks) for sorting because the number of elements to be sorted is too large to fit into memory. (CO3, K1) | 1 |
| | (a) internal sorting | |
| | (b) internal searching | |
| | (c) External sorting | |
| | (d) external searching | |
| (1.4) | Task dependency graph is _____ (CO4, K1) | 1 |
| | (a) directed | |
| | (b) undirected | |
| | (c) directed acyclic | |
| | (d) undirected acyclic | |

- (1.5) Which of the following is not a form of parallelism supported by CUDA? (CO5, K1) 1
- (a) Vector parallelism – Floating point computations are executed in parallel on wide vector units
 - (b) Thread level task parallelism – Different threads execute a different tasks
 - (c) Block and grid level parallelism – Different blocks or grids execute different tasks
 - (d) Data parallelism – Different threads and blocks process different parts of data in memory

2. Attempt all parts:-

- (2.1) Write a short note on accelerator. (CO1, K1) 2
- (2.2) Discuss importance of parallel execution. (CO2, K2) 2
- (2.3) Discuss the Master and slave model of parallel algorithm. (CO3, K2) 2
- (2.4) Define latency and bandwidth of memory. (CO4, K1) 2
- (2.5) Write short note on OpenMP programming. (CO5, K1) 2

SECTION-B

20

Answer any one of the following:-

- (3.1) Explain importance of high performance computing to solve real world problems with example (CO1, K2) 4
- (3.2) Discuss use of caches for improvement of latency. (CO1, K2) 4

Answer any one of the following:-

- (3.3) Explain the memory hierarchy with the help of diagram. (CO2, K2) 4
- (3.4) Discuss the differences between vector processing and scalar processing. (CO2, K2) 4

Answer any one of the following:-

- (3.5) Write short note on. a) Balanced Trees b) Divide and Conquer, (CO3, K2) 4
- (3.6) Explain Non-Uniform Memory Access(NUMA) architecture in details. (CO3, K2) 4

Answer any one of the following:-

- (3.7) Explain logical and physical organization of parallel programming platforms (CO4, K2) 4
- (3.8) Explain in details parallel programming in CUDA-C. (CO4, K2) 4

Answer any one of the following:-

- (3.9) Explain performance bottlenecks in parallel processing (CO5, K2) 4
- (3.10) Illustrate the libraries used for parallel processing. (CO5, K2) 4

SECTION-C

35

4. Answer any one of the following:-

- (4.1) Explain static mapping and dynamic mapping with the help of example. (CO1, K3) 7
- (4.2) Describe the challenges in high performance computing. (CO1, K2) 7

5. Answer any one of the following:-

- (5.1) Discuss the hybrid distributed-shared memory of parallel processing (CO2, K2) 7

- (5.2) Discuss the super computer with suitable example. (CO2, K2) 7
6. Answer any one of the following:-
- (6.1) Explain Granularity, Concurrency, and Dependency Graph. (CO3, K2) 7
- (6.2) Describe logical memory model of a Thread with respect to parallel processing. (CO3, K2) 7
7. Answer any one of the following:-
- (7.1) Discuss the difference between SIMD and MIMD. (CO4, K2) 7
- (7.2) Explain synchronization and different methods to achieve synchronization in parallel programming (CO4, K2) 7
8. Answer any one of the following:-
- (8.1) Explain message passing interface(MPI) and also write any five functions used in MPI with example. (CO5, K2) 7
- (8.2) Explain the Performance metrics for parallel system. (CO5, K2) 7

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