NAVODAYA INSTITUTE OF TECHNOLOGY, RAICHUR

SUBJECT: PARALLEL COMPUTING

Assignment Questions

Module 1

1. Explain Flynn's taxonomy of parallel computers with suitable examples.
2. Compare and contrast SIMD and MIMD systems in terms of architecture, performance, and applications.
3. Discuss the architecture and working of a vector processor. How do vector registers and interleaved memory enhance performance?
4. With the help of a diagram, explain the working of shared-memory and distributed-memory systems. Highlight their advantages and limitations.
5. Describe various interconnection networks used in parallel systems. Compare bus, crossbar, ring, mesh, and hypercube topologies with respect to scalability and performance.
6. Explain the cache coherence problem in shared-memory systems. Discuss snooping and directory-based cache coherence protocols with examples.
7. What is false sharing in cache memory? Illustrate with an example and suggest methods to reduce its impact on performance
8. Discuss the trade-offs between shared-memory vs. distributed-memory architectures in terms of scalability, cost, and programmability.
9. Explain the role of parallel software in exploiting modern multicore processors. Discuss challenges in thread synchronization and communication.

Module 2

1. Explain the concept of GPU programming. How does it differ from traditional CPU programming? Discuss challenges such as branching and scheduling in GPU threads.
2. What are hybrid programming models in parallel computing? Explain with an example how shared-memory and distributed-memory APIs can be combined.
3. Define and compare speedup and efficiency in MIMD systems. Illustrate with suitable numerical examples.
4. State and explain Amdahl's Law. Using an example, show why speedup is limited even when more processors are added.
5. Differentiate between strong scalability and weak scalability with an example. Why is scalability important in parallel programming?