

Roll No.

Total Pages : 3

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BT-6/M-24

ADVANCED COMPUTER ARCHITECTURE

Paper : PE-CS-S302A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Compare and contrast different types of parallel architectures, focusing on their classifications, characteristics, and suitability for various computational tasks. (8)
- (b) Discuss the types and levels of parallelism in parallel processing, highlighting their significance in improving computational performance and efficiency. (7)
2. (a) Evaluate the performance measures used to assess the effectiveness of pipelines in parallel processing, considering factors such as speedup, efficiency, and resource utilization. (8)
- (b) Discuss the architecture and operation of Very Long Instruction Word (VLIW) processors, examining their advantages, limitations, and applications in parallel computing. (7)

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UNIT-II

3. (a) Explain the concept of parallel decoding in superscalar processors. How does it contribute to increasing instruction throughput? (8)
- (b) Describe the technique of superscalar instruction issue and its role in enhancing processor performance. Compare it with scalar instruction issue. (7)
4. (a) Explain the importance of register renaming in superscalar processors. How does it help in avoiding data hazards and improving parallel execution? (8)
- (b) Discuss the branch problem in processors and its impact on performance. Explore various approaches to branch handling, including delayed branching and branch prediction schemes. (7)

UNIT-III

5. (a) Define the concepts of distributed and shared memory in MIMD architectures. Compare and contrast their advantages and disadvantages in terms of scalability and performance. (8)
- (b) Describe the Non-Uniform Memory Access (NUMA) architecture and its implications for scalability. Discuss how NUMA addresses the memory access latency issues compared to UMA. (7)

6. (a) Explain the static connection networks including linear array, ring, barrel shifter, and mesh. Compare their characteristics in terms of scalability, fault tolerance. (8)
- (b) Describe the design and operation of multistage networks, omega networks, and butterfly networks. (7)

UNIT-IV

7. (a) Explain the concept of memory hierarchy in modern computer systems. Discuss the role of cache memory in improving performance and the trade-offs involved in designing memory hierarchies. (8)
- (b) Describe the cache coherence problem in multi-processor systems. Discuss the challenges associated with maintaining cache coherence. (7)
8. (a) Explain snoopy cache protocols and how they address cache coherence in shared-memory systems. Provide examples of snoopy cache protocols and discuss their strengths. (8)
- (b) Discuss the role of directory schemes in maintaining cache coherence in multi-processor systems. Explain how directory-based cache coherence protocols work and compare them to snoopy cache protocols. (7)