

Topics for Comprehensive Exam on Advanced Computer Architecture

(Items in parentheses refer to sections of the text book given below)

Pipelines, Data dependency, Forwarding and Stalling, Integer Pipeline, Floating Point Pipeline, Calculation of Stall cycles for codes with dependencies (A5, A6a)

Dynamic Scheduling – Score boarding, Tomasulo’s Algorithm, Speculation, Their principle of working and Hardware support for them (A7, 2.4b, 2.5, 2.6)

Branch Prediction, Static and Dynamic, Size of Prediction Buffers, Branch Target Buffer, Calculation of Branch Penalties. (2.3, 2.9)

Multithreading (3.5)

Memory Hierarchy, specially **Cache**, Cache Performance, Effect of no cache, L1 cache, L2 Cache on Execution Time, Different Cache Organizations and calculation of misses for them (C1, C2, C3, 5.2)

Multiprocessors – classification of multiprocessors, Calculation of performance for different parallelizability in the code, Cache coherence Protocols, States and State Transitions (4.1, 4.2)

Interconnection Network - Difference between multiprocessors and other configurations such as LAN, WAN etc., Latency and four factors for latency, Raw Bandwidth, Effective Bandwidth (E1, E2)

Different topologies: mesh, torus etc. Their comparison, Crossbar versus Omega interconnection Networks (E4)

Switched Media versus Shared media, Routing - Store Forward Routing versus Worm Hole Routing (E3, E5)

Reference Book: “Computer Architecture” – Hennessy & Patterson, 4th Edition, Morgan-Kauffman, 2007, ISBN 13: 978-0-12-370490-0

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