

### 3 ISA vs. Microarchitecture [45 points]

Circle whether each of the following is an aspect of the ISA or the microarchitecture.

*Note: we will subtract 2 points for each **incorrect** answer and award 0 points for each unanswered question.*

1. [3 points] Width of the immediate value in an ADD instruction.  

1. ISA2. Microarchitecture
2. [3 points] The algorithm used by the ALU to perform multiplication.  

1. ISA2. Microarchitecture
3. [3 points] Number of bits required for indexing the source register of a store instruction.  

1. ISA2. Microarchitecture
4. [3 points] Number of entries in the L3 cache.  

1. ISA2. Microarchitecture
5. [3 points] The data cache organization (e.g., direct-mapped, set-associative).  

1. ISA2. Microarchitecture
6. [3 points] Support for conveying prefetching hints to the hardware via the compiler.  

1. ISA2. Microarchitecture
7. [3 points] Available data types (e.g., integer) for arithmetic and logic operations.  

1. ISA2. Microarchitecture
8. [3 points] Cache coherence protocol in multi-core processors.  

1. ISA2. Microarchitecture
9. [3 points] Width of the data bus between the processor and main memory.  

1. ISA2. Microarchitecture
10. [3 points] The memory controller's memory request scheduling algorithm.  

1. ISA2. Microarchitecture
11. [3 points] Instruction encoding for control flow and branch instructions.  

1. ISA2. Microarchitecture
12. [3 points] The design of the register renaming logic.  

1. ISA2. Microarchitecture
13. [3 points] Number of instructions decoded per cycle in a superscalar processor.  

1. ISA2. Microarchitecture
14. [3 points] L2 cache miss latency.  

1. ISA2. Microarchitecture
15. [3 points] Width of the program counter.  

1. ISA2. Microarchitecture