

Multiple Choice [30 points total, each question 2 points]

1. A XOR B is the equivalent of which of the following?
 - a. (A AND !B) OR (!A AND B)
 - b. (!A AND !B) OR (A AND B)
 - c. (A AND !B) AND (!A AND B)
 - d. (!A AND !B) AND (A AND B)
2. How many control bits are needed to control a Multiplexor with 8 inputs?
 - a. 2
 - b. 3
 - c. 8
 - d. 2^8
3. What is the minimum number of simultaneous reads and writes needed for a register file to work with the MIPS ISA?
 - a. 0 writes, 2 reads
 - b. 1 write, 2 reads
 - c. 1 write, 3 reads
 - d. 2 writes, 3 reads
4. What is the problem with busses for transmitting data off-chip?
 - a. Too many wires to fit on the board
 - b. Wires are hard to synchronize
 - c. Too hard to make the wires straight
 - d. All of the above
5. What does differential signaling in serial communications solve?
 - a. Increases speed by sending two bits at the same time
 - b. Improves synchronization by requiring only two wires
 - c. Reduces noise effects by subtracting out the noise at the end
 - d. Puts the clock into the signal by using two opposite wires
6. What is the benefit of DMA?
 - a. Uses the memory space for addressing I/O devices
 - b. Relieves the processor of the burden of having to check if the transfer is done
 - c. Simplifies the hardware design
 - d. Relieves the processor of the burden of managing the data transfer
7. How do you negate a two's complement number?
 - a. Invert the most significant bit
 - b. Invert
 - c. Invert and add 1
 - d. Invert and shift 1 step to the left
8. Compute $0011 - 1011$ for 4-bit signed magnitude numbers.
 - a. 0000
 - b. 0110
 - c. 1000
 - d. 1110
9. Compute $1101 - 1011$ for 4-bit two's complement numbers.
 - a. 0001

- b. 0010
 - c. 1000
 - d. overflow
10. For an 8-bit, signed-magnitude, fixed-point number format ddddd.ddd, what is the largest positive value you can represent?
- a. 7.5
 - b. 15.875
 - c. 31.875
 - d. 120
11. A single-cycle processor takes 200ns per instruction. If we pipeline it to 20 stages, and each pipeline register has 2ns delay, how much faster can it run?
- a. Same speed
 - b. 14.3 x faster
 - c. 16.7 x faster
 - d. 20.0 x faster
12. How much faster can my program run if I have 2000 cores and 10% of the program cannot be parallelized?
- a. 10x
 - b. 90x
 - c. 200x
 - d. 2000x
13. What do you do when you can't find a PTE (page table entry) in the TLB?
- a. Load the page from the cache
 - b. Load the page from disk
 - c. Load the PTE from the page table in memory
 - d. Cause a memory protection exception
14. What is **not** a benefit of having a virtual address to physical address translation?
- a. Memory protection
 - b. Using disk as memory
 - c. Faster cache accesses
 - d. Using fragmented memory
15. What happens when the program with the following page table tries to write to address 14?
- | VA → PA | on disk | access rights [page protection bits] |
|---------|---------|--------------------------------------|
| 1 → 8 | 0 | read/write |
| 2 → 9 | 0 | read/write |
| 3 → 14 | 0 | read only |
| 13 → 15 | 1 | read/write |
| 14 → 7 | 1 | read only |
- a. The data is loaded from the disk
 - b. The PTE is loaded from the page table into the TLB
 - c. A memory protection exception is generated
 - d. The data is written to physical address 7