

5 Memory Potpourri [30 points]

Read the following statements about memory organization & technology. Circle “True” if the statement is true and “False” otherwise. *Note: we will subtract 1 point for each **incorrect** answer and award 0 points for unanswered questions.*

1. [2 points] A main memory access typically consumes less energy than a register file access.
1. True ☐ 2. False ☒
2. [2 points] Building a larger memory array by increasing the length of the array’s wordlines and bitlines increases the cost (\$) but does not increase the access time of the array.
1. True ☐ 2. False ☒
3. [2 points] Activating a DRAM cell temporarily destroys the value stored in the DRAM cell.
1. True ☒ 2. False ☐
4. [2 points] DRAM cost (\$) per bit is much higher than that of SRAM.
1. True ☐ 2. False ☒
5. [2 points] The memory hierarchy of a typical computer system comprises different memory technologies.
1. True ☒ 2. False ☐
6. [2 points] Recently accessed data should be kept at the bottom-level in the memory hierarchy (e.g., main memory or disk) and not at the top-level (e.g., caches) in the hierarchy.
1. True ☐ 2. False ☒
7. [2 points] A program with no branches has high temporal locality in its instruction memory references.
1. True ☐ 2. False ☒
8. [2 points] A cache that has a block size equal to word size of memory access instructions cannot exploit spatial locality.
1. True ☒ 2. False ☐
9. [2 points] Memory banking enables concurrent access to the memory structure.
1. True ☒ 2. False ☐
10. [2 points] In DRAM, accesses to different rows in one bank can be serviced faster compared to accesses to the same row in one bank.
1. True ☐ 2. False ☒
11. [2 points] PCM is non-volatile, which means PCM retains stored data even when it is powered off.
1. True ☒ 2. False ☐
12. [2 points] If a hypothetical system is not constrained by chip area, memory cost (\$), and energy consumption, DRAM would be the best memory technology to use in that system.
1. True ☐ 2. False ☒
13. [2 points] The entire page table is typically stored in physical memory.
1. True ☐ 2. False ☒
14. [2 points] Virtual-to-physical address translation is on the critical path of a memory access.
1. True ☒ 2. False ☐
15. [2 points] Virtual memory makes programmer’s and microarchitect’s tasks easier.

1. True

2. False