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