

Lecture 12 Main Memory Exercises

Given a system with:

- 2 memory channels
- 4 DRAM DIMMS (2 DIMMS per channel)

Each DIMM has:

- 1 rank
- 8 chips per rank
- 8-bit column size
- 4 banks per chip
- 32,768 rows per bank
- 1,024 columns per bank

Q1: What is the total amount of physical memory in the system?

Solution:

a) Memory per chip = banks per chip * rows per bank * columns per bank * bits per column = $4 * 32768 * 1024 * 8 = 1\text{Gbit}$

Memory per DIMM = memory per chip * ranks per DIMM * chips per rank = $1\text{Gbit} * 1 * 8 = 8\text{Gbit}$

Total physical memory = memory per DIMM * DIMMs = $8\text{Gbit} * 4 = 32\text{Gbits} = 4\text{GBytes}$

Q2: What is the minimum number of physical address bits needed to cover the address space of this much memory?

Solution:

Minimum of physical address bits needed = $\log_2(4\text{G}) = \log_2(4 * 1024 * 1024 * 1024) = 32 \text{ bits}$