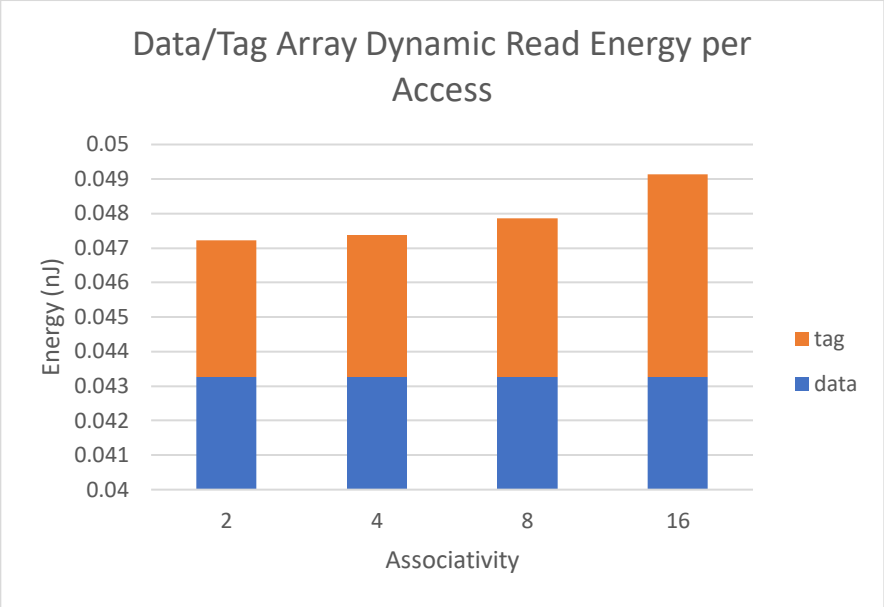
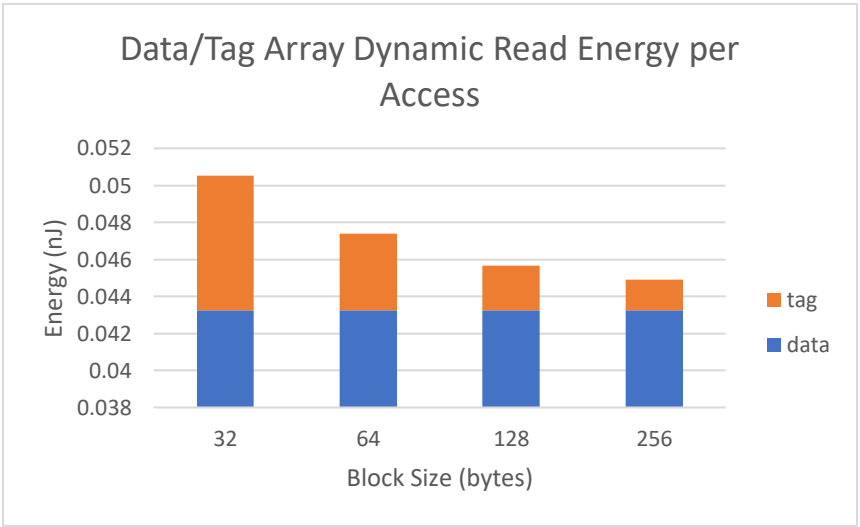
Problem 1A)



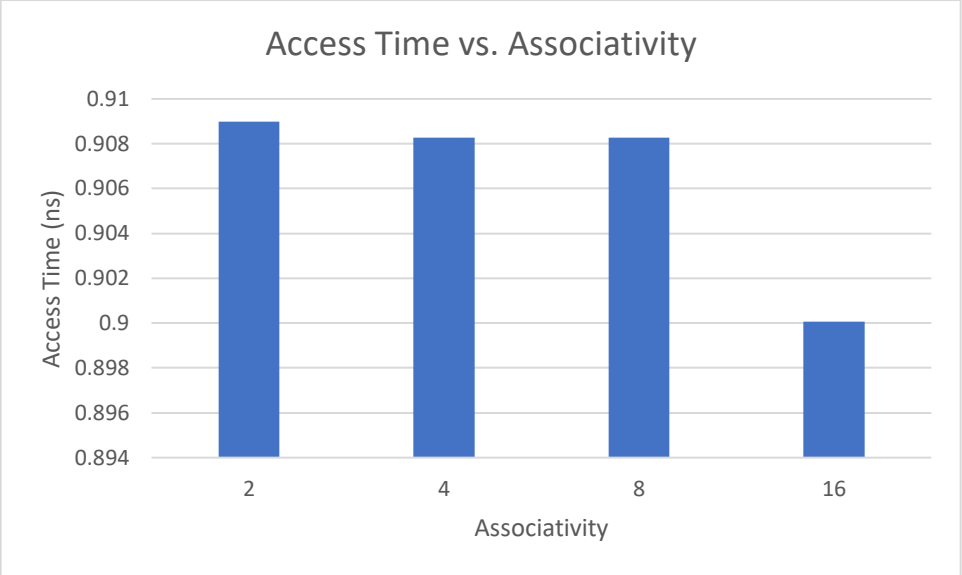
As associativity increases, the dynamic read energy per access for data array stays the same while for tag array increases. That is because with higher associativity, the tag fetch is slower, leading to a longer cycle time, thus consuming more energy. In addition, the miss rate would decrease, but miss penalty would be more significant, also leading to more energy per miss.

Problem 1B)



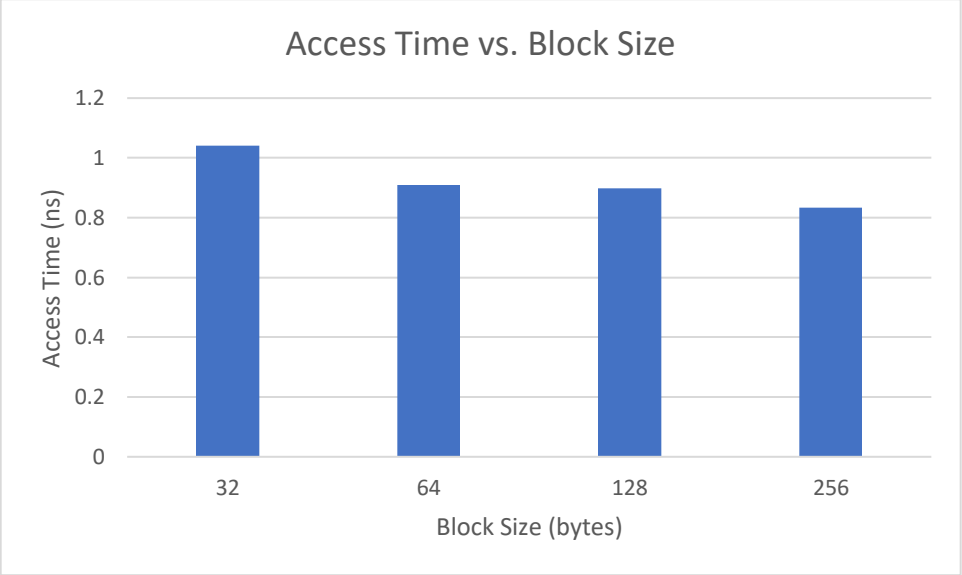
As block size increases, the dynamic read energy per access for data array stays the same while for tag array decreases. The miss rate will increase since cache size remain unchanged. The penalty will also increase, leading to poor performance of the cache in general. However, the energy decreases due to larger block size, since there are less tags to look for.

Problem 2A)



As the associativity increases, the access time decreases. Because cache misses are costlier than tags computation, bringing more ways would reduce cache misses thus decrease in access time. The tag size decreases as well, leading to access time decrease.

Problem 2B)



Access time decreases as block size increases, because miss rate and penalty increases. Tag size decreases with increasing block size, which leads to faster tag fetch, thus overall decrease in access time.

Problem 3)

The configuration I found was a 16-way associative cache with 256 bytes of block size. This configuration has area of (0.821308 + 0.0090436) = 0.8303516 mm^2, and energy-delay product of ((0.043258+0.00306393)*(0.802368)) = 0.037167.

In order to minimize energy-delay product (product of dynamic read access energy and access time), minimizing both read access energy and access time would be ideal. Looking at problem 1 & 2, increasing block size means decreasing access time (miss rate decreases) and decreasing dynamic access energy; increasing associativity means decreasing access time (miss rate decreases) as well as increasing dynamic access energy. To check for my deduction, I checked by configuring with highest block size, which maximizes both performances, and then modifies associativity to check which factor (access time or dynamic access energy) is influencing the overall performance most. Then found the best performance with 256 block size and 16-way associativity, which is also smaller $1mm^2$.