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CS 40
Section 4104
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Assignment 1.56

Consider a memory system with the following parameters:

$$T_c = 100\text{ns} \qquad C_e = 0.01 \text{ cents/bit}$$
$$T_m = 1,200\text{ns} \qquad C_m = 0.001 \text{ cents/bit}$$

a) What is the cost of 1 MByte of main memory?

$$1 \text{ MByte} \left(\frac{10^6 \times 8 \text{ bits}}{1 \text{ MByte}} \right) \left(\frac{0.001 \text{ cents}}{1 \text{ bit}} \right) = 8,000 \text{ cents}$$

b) What is the cost of 1 MByte of main memory using cache memory technology?

$$1 \text{ MByte} \left(\frac{10^6 \times 8 \text{ bits}}{1 \text{ MByte}} \right) \left(\frac{0.01 \text{ cents}}{1 \text{ bit}} \right) = 80,000 \text{ cents}$$

c) If the effective access time is 10% greater than the cache access time, what is the hit ratio H?

$$T_{eff} = 1.1 (100\text{ns}) = 110 \text{ ns}$$

$$T_{eff} = (1 - H) T_m + H T_c$$

$$H = \frac{T_m - T_{eff}}{T_m - T_c} = \frac{1200\text{ns} - 110\text{ns}}{1200\text{ns} - 100\text{ns}} = \frac{1090\text{ns}}{1100\text{ns}} = 0.99$$