SOFT400127: Computer Organization and Architecture 2022-Fall

Homework- **5** Solutions

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2022 年 10 月 20 日

Honor Code: I promise that I finished the homework solutions on my own without copying other people's work.

6.3

a.

$$\text{capacity} = 8 \times 256 \times 32 \times 1 \text{ KB} = 2^{16} \text{ KB} = \textbf{64 MB}$$

b.

$$\begin{aligned} T_a =& T_s + \frac{1}{2r} + \frac{b}{rN} = 8 \text{ ms} + \frac{1}{2 \times \frac{3000\text{rpm}}{60\text{spm}}} + \frac{b}{\frac{3000\text{rpm}}{60\text{spm}} \times 32 \text{ KB}} + \left\lfloor \frac{b}{32 \text{ KB}} \right\rfloor \times 1.5 \text{ ms} \\ =& 18 + 0.625b + 0.5 \left\lfloor \frac{b}{32} \right\rfloor \text{ (ms)} b \text{ is number of KB to be transferred.} \end{aligned}$$

c.

$$\begin{aligned} T =& \frac{b}{rN} + \text{ track-to-track access time} = \frac{2.5 \text{ MB}}{\frac{3000\text{rpm}}{60\text{spm}} \times 32 \text{ KB}} + \left\lfloor \frac{2.5 \text{ MB}}{32 \text{ KB}} \right\rfloor \times 1.5 \text{ ms} \\ =& 1600 + 120 = 1720 \text{ ms}. \end{aligned}$$

d.

$$\text{rate} = \frac{2.5 \text{ MB}}{1720 \text{ ms}} = 1.45 \text{ MB/s}$$

6.10

a.

$$\left\lceil \frac{1000}{500} \right\rceil \times 150 = \$300$$

b.

$$\left\lceil \frac{1000}{400} \right\rceil \times 50 + 2500 = \$2650$$

c.

$$\left\lceil \frac{x}{400} \right\rceil \times 50 + 2500 < \left\lceil \frac{x}{500} \right\rceil \times 150 \Longrightarrow x > 14000 \text{ GB}$$

d.

bigger data capacity requirement and slower speed requirement.

Other things

- LaTeX code refer to these things and was complied on texlive2020.
  - UCB-CS70's given homework template.
  - A free website useful to edit LaTeX formula code.
- Some context refer to Professor Li. 's PPT.

Thanks for your correcting and grading :).