

Homework 1

Q 1.6

(a)

$$\text{workload A} = \frac{225000}{13461} = 16.71$$

$$\text{workload B} = \frac{220000}{36465} = 7.68$$

(b)

$$\text{General} : 0.7 \times 0.42 \times 0.3 \times 1 = 0.594$$

$$\text{GPU} : 0.7 \times 0.37 + 0.3 \times 1 = 0.559$$

$$\text{TPU} : 0.7 \times 0.8 + 0.3 \times 1 = 0.886$$

(c)

$$\text{TPU over GPU} = \frac{505000}{371} - \frac{49926}{711} = 1291 \text{ (Through put /w)}$$

$$\text{GPU} = 0.357 + (0.91 - 0.357) \times 0.559 = 0.711 \text{ W}$$

$$\text{TPU} = 0.290 + (0.384 - 0.290) \times 0.86 = 0.371 \text{ W}$$

$$\text{performance of GPU} = 225000 + 280000 = 505000$$

$$\text{performance of GPU} = 13461 + 36465 = 49926$$

(d)

speed up

GPU

TPU

$$\text{GPU} = \frac{1}{\left(\frac{0.4}{2.46} + \frac{0.1}{2.76} + \frac{0.5}{1.25}\right)} = 1.67$$

$$\text{TPU} = \frac{1}{\left(\frac{0.4}{41.0} + \frac{0.1}{21.2} + \frac{0.5}{0.167}\right)} = 0.33$$

(e)

$$\text{General} : \frac{14000}{504} = 27.8 > 27$$

$$\text{GPU} : \frac{14000}{1838} = 7.62 > 7$$

$$\text{TPU} : \frac{14000}{861} = 16.3 > 16$$

(f)

$$\text{General} : \frac{2200}{504} = 4.37 > 4 \quad \frac{14000}{4 \times 504} = 6.74 > 6$$

$$\text{GPU} : \frac{2200}{1838} = 1.2 > 1 \quad \frac{14000}{1838} = 7.62 > 7$$

$$\text{TPU} : \frac{2200}{861} = 2.56 > 2 \quad \frac{14000}{2 \times 861} = 8.13 > 8$$

Q 1.9

(a) 60%

$$(b) 0.4 + 60\% \times 0.2 = 0.58 \quad 58\%$$

$$(c) \text{ power} = \frac{(0.8)^2 \sqrt{0.6}}{10 \cdot 1^2 \sqrt{1}} = 0.256$$

$$(d) 0.4 + 0.3 \times 2 = 0.46 \quad 46\%$$

Q 1.11

$$(a) \text{ MTTF} = \frac{35}{10000} \times 3333 = 11.67 \text{ days}$$

$$(b) \text{ MTTF (new)} = \frac{70}{10000} \times 3333 = 23.3 \text{ days}$$

If the server farm make a great profit, it is worth double MTTF

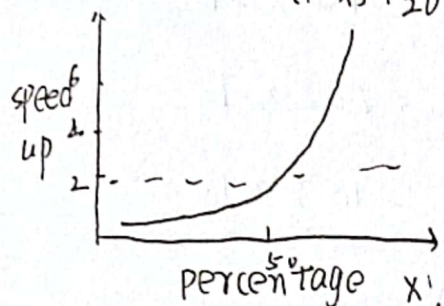
$$(c) 90000 = \frac{5x}{4} \quad 2x = 144000 / h$$

so cost is 144000 per hour



Q 1.12

$$(a) \text{ speed up} = \frac{1}{(1-x) + \frac{x}{20}}$$



$$(b) 2 = \frac{1}{(1-x) + \frac{x}{20}} \quad x = 52.6\%$$

$$(c) \frac{\frac{0.526}{20}}{\frac{0.526}{20} + (1-0.526)} = 5.3\%$$

$$(d) 2 \text{ units} = \frac{1}{(1-0.5) + 0.1 \times \frac{0.5}{20} + 0.9 \times \frac{0.5}{20 \times 2}} = 1.95$$

$$4 \text{ units} = \frac{1}{(1-0.5) + 0.1 \times \frac{0.5}{20} + 0.9 \times \frac{0.5}{20 \times 4}} = 1.97$$

Q 1.14

$$(a) \frac{1}{0.8 + \frac{0.2}{2}} = 1.11$$

$$(b) \frac{1}{0.7 + \frac{0.2}{2} + 0.1 \times 1.5} = 1.05$$

$$(c) \text{ floating points: } \frac{0.1}{0.95} = 10.5\%$$

$$\text{cache: } \frac{0.15}{0.95} = 15.8\%$$

Q 1.15

$$(a) \frac{1}{0.5 + \frac{0.1}{2}} = 1.91$$

$$(b) \frac{1}{0.1 + \frac{0.9}{2}} = 7.10$$

(d)

$$a : 1.8$$

$$b : 0.27 \times 22 = 5.96 \times 6 =$$

$$\text{speed up} = \frac{1}{0.2 + \frac{0.8}{6}} = 3$$

$$c : 0.18 \times 22 \approx 4$$

$$\text{speed up} = \frac{1}{0.4 + \frac{0.6}{4}} = 1.82$$

$$d : 0.14 \times 22 \approx 3$$

$$\text{speed up} = \frac{1}{0.1 + \frac{0.9}{3}} = 2.5$$

$$(e) \frac{0.41}{1.8} + \frac{0.27}{3} + \frac{0.18}{1.82} + \frac{0.14}{2.5} = 2.12$$

