CAS CS 350 HW1

Andrea Lopez

TOTAL POINTS

68 / 90

QUESTION 1

Q1 40 pts

1.1 Q1 34 / 40

- **0 pts** All Correct

a)

- **1.5 pts** Minor error
- **4 pts** Incorrect, but some work shown
- **6 pts** Incorrect and no work shown

b)

- **0.5 pts** Minor error
- **2.5 pts** Incorrect, but some work shown
- **4 pts** Incorrect and no work shown

c)

- **0.5 pts** Minor error
- **2.5 pts** Incorrect, but some work shown
- **4 pts** Incorrect and no work shown

d)

- **1.5 pts** Minor error
- **4 pts** Incorrect, but some work shown
- **4 pts** No diagram
- **10 pts** Incorrect and no work shown

e)

- **2 pts** Minor error
- **4 pts** Incorrect, but some work shown
- **6 pts** Incorrect and no work shown

f)

- **3 pts** Minor error
- ✓ **- 6 pts Incorrect, but some work shown**
- **10 pts** Incorrect and no work shown

QUESTION 2

Q2 20 pts

2.1 Q2 6 / 20

- **0 pts** Correct

d)

- ✓ **- 0 pts Correct**
- **2 pts** Correct number of CPUs but no reasoning given
- **3 pts** Incorrect number of CPU but reasoning is shown
- **5 pts** Incorrect / No Answer given

e)

- **0 pts** Correct
- **2 pts** Correctly states possible but no reasoning is shown or incorrect reasoning
- ✓ **- 4 pts Incorrect conclusion but reasoning is shown**
- **5 pts** No answer given/Incorrect

f)

- **0 pts** Correct
- **3 pts** Minor issues in reasoning/unclear reasoning but correct response time
- **4 pts** Correct response time but no work is shown
- **5 pts** Incorrect response time but work is shown
- **8 pts** Incorrect Answer with no work given
- ✓ **- 10 pts No answer given**

QUESTION 3

Q3 30 pts

3.1 Q3 28 / 30

- **0 pts** Correct

a)

- **0 pts** Correct
- **1 pts** Correct answer without calculation
- **3 pts** Incorrect answer but work is shown
- **4 pts** Incorrect answer

- **5 pts** No answer given

b)

- **0 pts** Correct
- **1 pts** Correct answer without calculation
- **3 pts** Incorrect answer but work is shown
- **4 pts** Incorrect answer
- **5 pts** No answer

c)

- **0 pts** Correct
- **1 pts** Correct answer with no reasoning

✓ - **2 pts** **Incorrect reasoning/incorrectly used $${speedUp \over cost}$$**

- **4 pts** Incorrect answer
- **5 pts** No answer given

d)

- **0 pts** Correct
- **1 pts** Correct answer with no calculation
- **3 pts** Incorrect answer with calculation
- **4 pts** Incorrect answer
- **5 pts** No answer given

e)

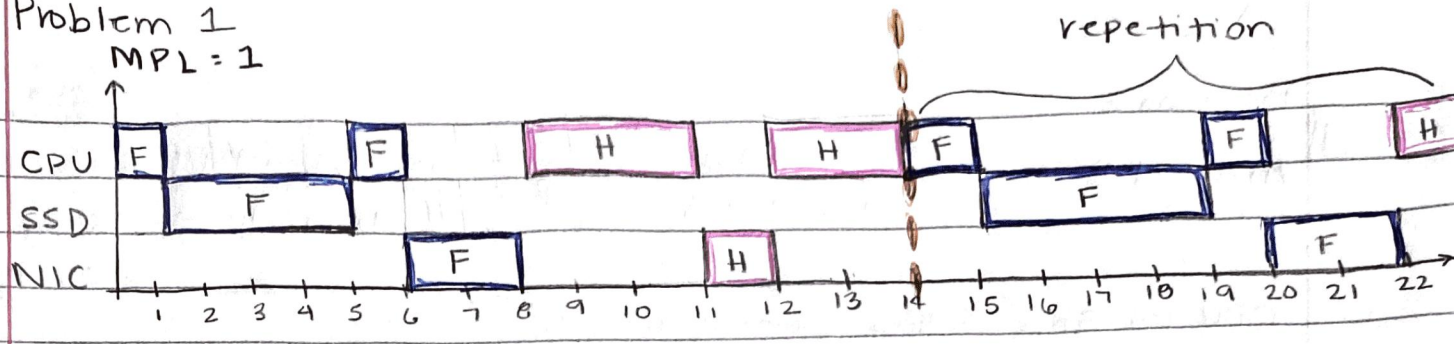
- **0 pts** Correct
- **3 pts** Incorrect answer with calculation shown
- **4 pts** Incorrect Answer
- **5 pts** No answer given

f)

- **0 pts** Correct
- **3 pts** Incorrect answer with calculation shown
- **4 pts** Incorrect answer
- **5 pts** No answer given

c) although it is not right to use speedup/cost, this formula actually gives you how much **speedup** you will get by paying one dollar. So higher the resulting value is, the more speedup you get per dollar.

Problem 1



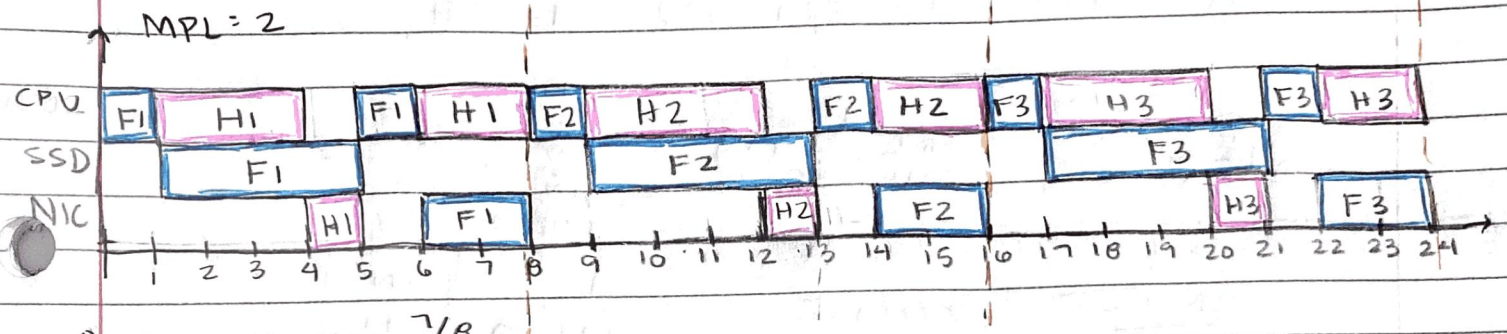
a) CPU utilization : $7/14 = 1/2$

SSD utilization : $4/14 = 2/7$

NIC utilization : $3/14$

b) HTTP throughput : $1/14$

c) FTP throughput : $1/14$



d) CPU utilization: $7/8$

SSD utilization: $4/8 = 1/2$

NIC utilization: $3/8$

e) HTTP throughput : $1/8$

FTP throughput : $1/8$

TOTAL throughput : $2/8 = 1/4$

f) Max throughput : $3/8$

1.1 Q1 **34 / 40**

- **0 pts** All Correct

a)

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c)

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- **4 pts** No diagram
- **10 pts** Incorrect and no work shown

e)

- **2 pts** Minor error
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f)

- **3 pts** Minor error
- ✓ **- 6 pts Incorrect, but some work shown**
- **10 pts** Incorrect and no work shown

Problem 2

d) Amdahls Law = $\frac{1}{1-f(1-(\frac{1}{N}))}$, $f = \frac{\text{time parallelizable}}{\text{total time}}$

CPU for 5ms → time parallelized

5 ms + 2ms + 3 ms = 10 ms = Total machine running time

Step 1) Plug in values into Amdal's Law and solve

$$\frac{1}{1-f(1-(\frac{1}{N}))} = \frac{1}{1-\frac{5}{10}(1-\frac{1}{N})} = \frac{1}{1-\frac{1}{2}(1-\frac{1}{N})} =$$

$$\frac{1}{1-\frac{1}{2}+\frac{1}{2N}} \quad \frac{1}{\frac{(2N)1}{(2N)2}+\frac{1}{2N}(2)} = \frac{1}{\frac{2N}{4N}+\frac{2}{4N}} =$$

$$\frac{1}{\frac{2N+2}{4N}} = \frac{1}{\frac{2(N+1)}{4(N)}} = \frac{1}{\frac{N+1}{2N}} \rightarrow \boxed{\frac{2N}{N+1}}$$

Step 2) set it equal to 1.5 & solve for N

$$N+1\left(\frac{2N}{N+1} = 1.5\right)N+1$$

$$2N = 1.5N + 1.5$$

$$-1.5N \quad -1.5N$$

$$\frac{0.5N}{0.5} = \frac{1.5}{0.5}$$

$$\boxed{N = 3}$$

↳ 3 CPUs are required for to speedup to be at least 0

Problem 2

NO

e) Since we need at least 3 CPU's in order for the machine to speedup, then it is not possible to halve the HTTP handling time. In other words, if we halve the handling time, then we will have less CPU's than needed (2) to acheive that speedup, and we can't have that. Therefore, no it is not possible to halve the HTTP time.

f)

2.1 Q2 6 / 20

- **0 pts** Correct

d)

✓ **- 0 pts Correct**

- **2 pts** Correct number of CPUs but no reasoning given
- **3 pts** Incorrect number of CPU but reasoning is shown
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e)

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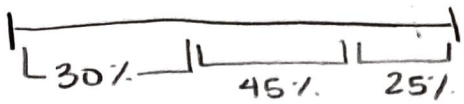
✓ **- 10 pts No answer given**



Problem 3

$\frac{T(A)}{T(B)} = (1 - .25) = .75$

a) Speedup for option A:

$$\text{Amdahl's Law} = \frac{1}{1 - f(1 - (\frac{1}{N}))}, \quad f = 0.30$$

step 1) find n (rate)

$$\frac{1}{T} = \frac{1}{.75}$$

Step 2) plug into Amdahl's Law:

$$\frac{1}{1 - f(1 - \frac{1}{n})} = \frac{1}{1 - 0.30(1 - \frac{1}{.75})} = \frac{40}{37} = \boxed{1.08}$$

b) Speedup for option B:

Step 1) solve for n

$$\frac{15}{15} - \frac{10}{15} = \frac{5}{15} = \frac{1}{3} \qquad \frac{T(A)}{T(B)} = \frac{2}{3} \rightarrow \text{rate} = \frac{1}{\frac{2}{3}}$$

Step 2) plug into Amdahl's Law

$$\frac{1}{1 - f(1 - \frac{1}{n})} = \frac{1}{1 - 0.45(1 - \frac{1}{\frac{2}{3}})} = 1.76$$

c) To find per dollar basis $\rightarrow \frac{\text{speedup}}{\text{cost}}$

Option A: $\frac{1.08}{8000} = 0.000135$

Option B: $\frac{1.176}{15000} = 0.0000784 \rightarrow$ Option b is better because it is less than option A!

Problem 3

d) $$\frac{1}{\left((f_1)\cdot\left(1-\frac{1}{n_1}\right)+(f_2)\cdot\left(1-\frac{1}{n_2}\right)+(1-f_1-f_2)\right)} = \frac{1}{(.63)\left(1-\frac{1}{.75}\right)+(.45)\left(1-\left(\frac{1}{1-\frac{1}{3}}\right)\right)+(1-.3-.45)} = 1.29$$

e) $$\frac{1}{1-f\left(1-\frac{1}{n}\right)} = \frac{1}{1-0.3\left(1-\frac{1}{\infty}\right)} = \frac{1}{1-.3(1)} = \frac{1}{.7} = \frac{10}{7}$$

f) $$\frac{1}{1-0.45\left(1-\frac{1}{n}\right)} = \frac{1}{1-0.45\left(1-\frac{1}{\infty}\right)} = \frac{1}{1-0.45} = \frac{1}{.55} = 1.818$$

3.1 Q3 28 / 30

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