Homework4

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Q1 Simultaneous multithreading (SMT)

B
Suppose each thread needs M registers.
For N threads, we need at least $M * N$ registers. And these registers can't be freed until next instruction committed.

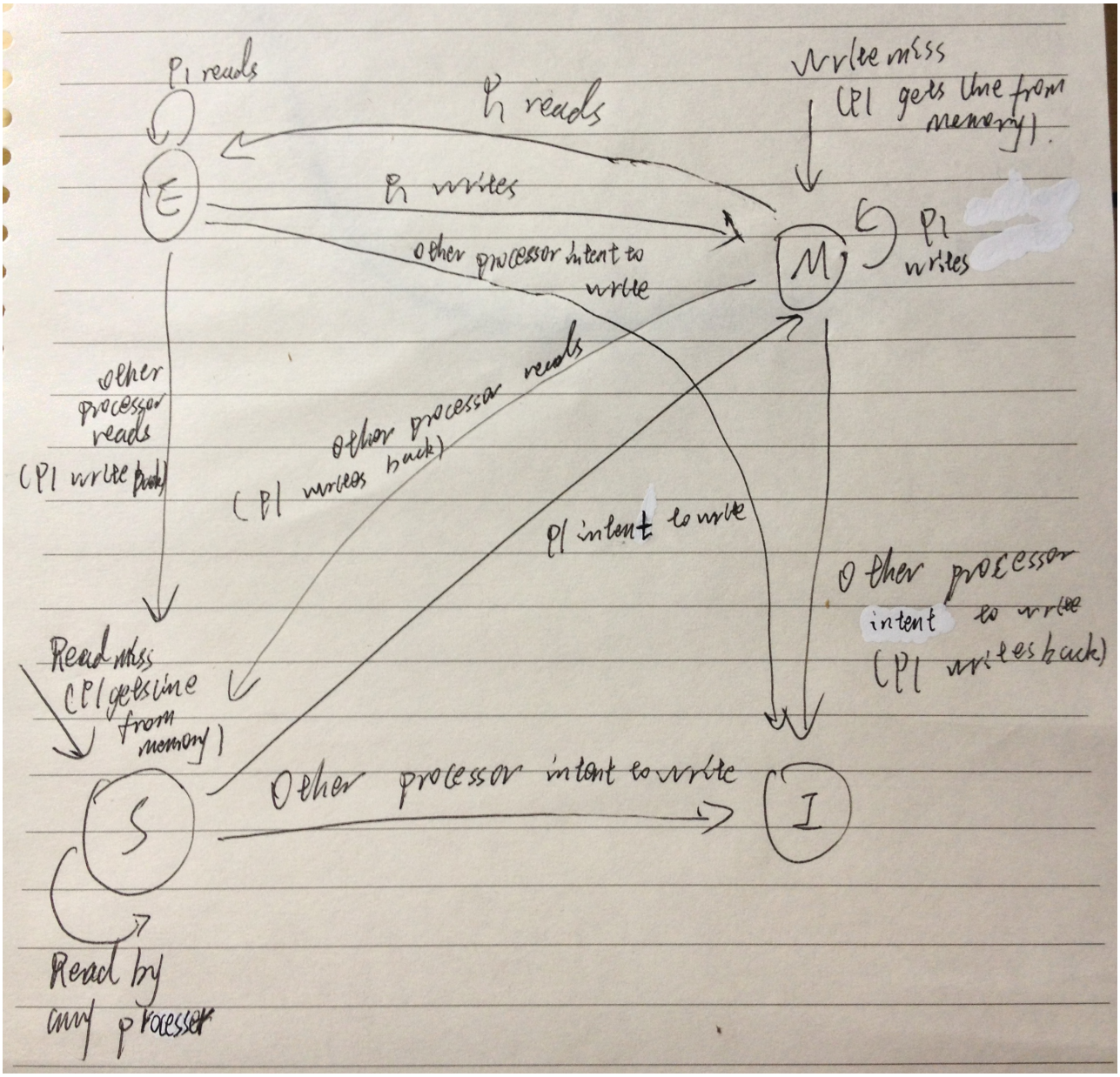
Q2 Amdahl' s Law and Gustafson' s Law

1.
$$Time_{enhanced} = 200 \times 30\% + 200 \times 70\% \div 5 = 88$$

2.
$$Speeup_{max} = 1 \div 30\% = 3.333$$

3.
$$Speedup = \frac{30\% + 70\% \times 8}{30\% + 70\% \times 8 \div 8} = 5.9$$

Q3 Coherence Protocol Design



Q4 GPU

1. $$1.5GHz \times 0.85 \times 70\% \times 80\% \times 1 \times 32/4 = 57.12 \text{ GFLOP/sec}$$

2. (a)

$$Speedup = 16 \div 8 = 2$$

(b)

$$Speedup = 15 \div 10 = 1.5$$

(c)

$$Speedup = 0.95 \div 0.85 = 1.12$$