Computer Architecture I Mid-term Exam 1

Chinese Name: _____

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Question	Points	Score
1	1	
2	9	
Total:	10	

- This test contains 3 numbered pages, including the cover page, printed on both sides of the sheet.

- We will use blackboard for grading, so only answers filled in at the obvious places will be used.

- Use the provided blank paper for calculations and then copy your answer here.

- Please turn off all cell phones, smartwatches, and other mobile devices. Remove all hats and headphones. Put everything in your backpack. Place your backpacks, laptops and jackets out of reach.

- Unless told otherwise always assume a 32bit machine.

- The total estimated time is 120 minutes.

- You have 120 minutes to complete this exam. The exam is closed book; no computers, phones, or calculators are allowed. You may use two A4 pages (front and back) of handwritten notes in addition to the provided green sheet.

- There may be partial credit for incomplete answers; write as much of the solution as you can. We will deduct points if your solution is far more complicated than necessary. When we provide a blank, please fit your answer within the space provided.

- Do NOT start reading the questions/ open the exam until we tell you so!

1. First Task (worth one point): Fill in you name
   Fill in your name and email on the front page and your ShanghaiTech email on top of every page (without @shanghaitech.edu.cn) (so write your email in total 3 times).

2. OpenMP [9 points]
The following function calculate the numbers of 0 in the array 'b' and assign each item of array b to array a by index weighting.

```c
#include <omp.h>

int Get_num_zero(int inf,int *a,int *b){
    int cnt = 0;
    #pragma omp parallel for
    for (int i = 0; i < 20; i++) {
        if (b[i] == 0){
            #pragma omp critical
                cnt ++;
        }
        a[i] = b[i] + inf * (i + 1);
    }
    return cnt;
}
```

3

(a) (True or False) Please fill your answer (T or F) in the parentheses.

1. Both 'parallel' and 'master' directives have an implicit barrier synchronization at the end of part. ( )
2. We can use 'break' instruction to jump outside of 'parallel' pragma block. ( )
3. We can use 'atomic' directive to replace 'critical' without data race. ( )

2

(b) Identify the data sharing attributes of the following variables with shared or private.

cnt _____

i _____

4

(c) Rewrite the for loop part(line 5 - line 10) using 'reduction' directive rather than original 'critical' directive and still avoid data race. Then point out which method is more efficient, and why? (You don't need to use all blank line if not necssary.)

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