CS100 Midterm Exam Cover Sheet

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PRINT your name: (last name)_____, (first name)_____

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PRINT your student ID:_____

PRINT your tutorial group number:_____

INSTRUCTIONS:

- You have 90 minutes (~10:25-11:55) to complete the exam.
- Your exam will not be graded unless you complete the above section and the cover sheet, and turn in both this exam book and the cover sheet.
- This exam is **closed-book and closed-notes**, and **no electronic devices are permitted**.
- Mark your answers on the exam itself. We will not grade answers written on scratch paper.
- Your performance is supposed to reflect your own level of understanding of the material. You are not allowed to talk with your neighbor or look at his exam sheet. Failure to obey this rule will result in a **point deduction**.
- If you finish early, you can hand in the exam and leave early. However, this is only possible until at latest 15 minutes before the ending time of the exam. If less than 15 minutes are left, please keep sitting and wait until the end.

STOP! Do not turn this page until the instructor tells you to do so.

Do NOT write in this section.

Problem	Max	Points
1	4	
2	4	
3	4	
4	4	
5	4	
Total	20	

Important: Verify that your exam book has 9 pages.

Problem 1: Multiple-choice questions (4 points)

Please answer the following questions by ticking the choices that apply. Note that multiple choices are possible for each question. Mark all choices that apply as follows: [x].

Question 1: Consider the following C program:

```
void f(int, short);
int main()
{
     int i = 100;
     short s = 12;
     short *p = &s;
     _____________; // call to f()
     return 0;
}
void f(int i, short s)
{
   i++;
}
```

Which of the following expression(s), when inserted in the blank line above, will result in a compile-time error?

(language: C, 1 point)

```
[ ]  f(s, *s);
[ ]  i = f(i, s);
[ ]  f(i, *s);
[ ]  f(i, *p);
```

Question 2: In the following C program:

```
#include <stdio.h>
int main(void)
{
     int arr[10][10][10];
   arr[5][5][5] = 2018;
     ____________________  // printf statement here
   return 0;
}
```

Which of the following printf statement(s), when inserted in the blank line, would print 2018?

(language: C, 1 point)

```
[ ]  printf("%d", arr[5][5][5]);
[ ]  printf("%d", *(*(*(arr + 5) + 5) + 5) );
[ ]  printf("%d", (*(*(arr + 5) + 5))[5] );
[ ]  printf("%d", *( (*(arr + 5))[5] +5) );
```

Question 3: What procedures of a parent class will be accessible in a child class?
(language: C++, 1 point)

[ ] **public** procedures
[ ] **protected** procedures
[ ] **private** procedures

Question 4: Choose all of the following declarations that correctly overload a procedure with the declaration `float add( float input );` (language: C++, 1 point)

[ ] `float add( float newElement );`
[ ] `double add( float newElement );`
[ ] `float add( float newElement1, float newElement2 );`
[ ] `float add( int newElement );`

Problem 2: Knowledge questions (4 points)

Question 1: How many bytes are required to store the string literal "`I am good.`"? Briefly explain your answer.

(language: C, 1 point)

Question 2: Name the two typical ways for parameter passing between functions in programming.

(language: C, 1 point)

Question 3: Mention the two types of “Has-a”-Relationships viewed in class.
(language: C++, 1 point)

Question 4: Put down a one-sentence statement explaining the purpose of *include-guards*.
(language: C++, 1 point)

Problem 3: What is the output of the following C code?

(language: C, 4 points)

```
#include <stdio.h>
int f(int n);
int main()
{
   printf("Result = %d\n", f(5));
   return 0;
}

int f(int n)
{
   int a, b;
   if (n > 2) {
        a = f(n-1);
        b = f(n-2);
        printf("a = %d, b = %d\n", a, b);
        return a + b;
   } else {
        return 2;
   }
}
```

Problem 4: Circle the errors in the following function written in C, and rewrite the correct function in your answer book. Briefly explain the changes that you made to the original function.

(language: C, 4 points)

```
// This function reverses the characters in a string
void reverse(char *s)
{
   int n;
   char *tmp, *p, *q;
   n = strlen(s);
   q = (n > 0) ? (s+n) : s;
   for (p=s; p < q; ++p, --q) {
        *tmp = *p;
        *p = *q;
        *q = *tmp;
   }
}
```

Problem 5: Inheritance and polymorphism (C++)

(language: C++, 4points)

Imagine the following base class:

```
class Shape {
public:
     Shape();
     virtual ~Shape();

     virtual float Area() = 0;
};

Shape::Shape(){}
Shape::~Shape(){}
```

a) Write down the declaration of a child class Square that inherits from the above abstract parent class Shape. The child class takes exactly one float parameter in the constructor, which denotes the edge length of the square. You may assume that everything is in one file, so you do not have to worry about header inclusion etc.
b) Write down the implementation of all procedures in the child class (including constructors and destructors).

(end of exam)