ECE 2400 Computer Systems Programming

Topic 3: C Types

http://www.csl.cornell.edu/courses/ece2400
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Please do not ask for solutions. Students should compare their solutions to solutions from their fellow students, discuss their solutions with the instructors during lab/office hours, and/or post their solutions on Ed for discussion.

List of Problems

Problem 1. Short Answer

Carefully plan your solution before starting to write your response. Please be brief and to the point; if at all possible, limit your answers to the space provided.

Part 1.A Unsigned Integer Addition

Consider the following C program. The `add` function takes two unsigned integers as parameters and returns the sum of these two integers.

```
1  typedef unsigned int uint_t;
2
3  uint_t add( uint_t x, uint_t y )
4  {
5    return x + y;
6  }
7
8  int main( void )
9  {
10   uint_t a = add( 5, -100 );
11   return 0;
12 }
```

What is the value of the variable `a` after the execution of line 10?

- A. The C programming language standard specifies this program is illegal
- B. `-95`
- C. `105`
- D. A very large positive number
- E. A very small negative number

Please justify your answer.

Part 1.B Complex Multiplication

The following `cmult` function takes two complex numbers as parameters and returns the (complex) multiplication of these two numbers. **Draw the state diagram that corresponds to the execution of this C program.** You must clearly label all variables in your diagram.

```
01 // User-defined type for complex numbers
02
03 typedef struct
04 {
05   double re; // real part
06   double im; // imaginary part
07 }
08 complex_t;
09
10 // Function for complex multiplication
11
12 complex_t cmult( complex_t x, complex_t y )
13 {
14   complex_t z;
15   z.re = ( x.re * y.re ) - ( x.im * y.im );
16   z.im = ( x.re * y.im ) + ( x.im * y.re );
17   return z;
18 }
19
20 // Main function
21
22 int main( void )
23 {
24   complex_t a;
25   a.re =  2.0;
26   a.im =  0.5;
27
28   complex_t b;
29   b.re = 10.0;
30   b.im =  8.0;
31
32   complex_t c;
33   c = cmult( a, b );
34   return 0;
35 }
```