CS 240, Computer Arch I **OPEN BOOK/OPEN NOTES** Spring 2010
Quiz 1 - **Make-Up1** **FOR PARTIAL CREDIT SHOW ALL WORK!!** P. O'Neil

NAME _____

(1) (12 points) Say **Exactly** what is printed out by the following program. **Show all intermediate results**. If more than one operation is performed in an expression, write parentheses in to show the precedence (what gets done first), e.g.: a + b * c becomes a +(b * c).

```
unsigned c;
.  .  .
c = '\156';


c =  c  >>  1 | 0XBA - 065 ;



c %= 64;    c <<= 1;


printf("Values are octal %o, decimal %d, and hexacecimal %x.\n", c, c>>1, c);
```

Answer (**PRECISE WORDING**):

(2) (8 points) What is printed out by the following program? **Explain in words what the function func is doing.** (**DON'T just paraphrase the logic**--what's the POINT of the function func?)

```
main ( )
{
    int i; char msg [ ] = "XeDZ3a";

    for (i = 1; i < 6; ++i )  /* Careful here ! ! */
        msg[i] = func(msg[i]);
    printf("%s\n", &msg[0]);
}

char func (char c);
{
    if ('A' <= c && c <= 'Z')
        return 'Z' - c + 'a';
    else
        return (c+2);
}
```

Answer1 (**WHAT IS PRINTED OUT?**):

Answer2 (**WHAT IS func DOING? Complex: three clauses at least.**):

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(1) c = '\156' in binary: '01'101'110'. c = ((c >> 1) | (0xBA-065)), so we start by taking
c >> 1 gives: '0011'0111'; next, 0xBA is '1011'1010' and 065 is '00'110'101'
'1011'1010'
- '0011'0101' and subtract with borrows: 1 from 1 is 0, 1 from 0 is 1 borrowed 1
'1000'0101' so now we need to | this with latest value of c >>1 above:

Alternatively, '1011'1010' = 11X16 + 10 = 186; 065 is 6X8 + 5 = 53; 185 - 53 = 133. Convert to binary: 133, 66, 33, 16, 8, 4, 2, 1 And counting backwards for binary gives: '1000'0101'

'1000'0101' so now we need to | this with latest value of c >>1 above:
| '0011'0111'
'1011'0111' Now c %= 64 ('0100'0000'), which leaves bottom 6 bits: '0011'0111'.
(You can convert it to decimal and back to check %= 64 if you want, but this is obvious.)

Now c<<=1 gives '0110'1110' = '01'101'110 or 0156 (octal); now c>>1 is '0011'0111' = 0x37 = 3*16 + 7 == 55)(decimal); '0110'1110' is 0x6e.

Answer (Precise): **Values are octal 156, decimal 55, hexadecimal 6c.**

(2) Answer1: (**WHAT IS PRINTED OUT?**): Xgwa5c (8 points if right; if not but description below gives right idea, may help point grade.)

Answer 2 (**WHAT IS func DOING?**): We are modifying msg[i] in a loop starting with i = 1, so the initial character X in msg[0] never gets changed. Now func(char c) takes upper case characters (if('A' <= c && c <= 'Z')) and lowers their case while reversing them in the alphabet (return 'Z' - c + 'a'), so Z goes to a, Y goes to b, . . ., A goes to z, (D goes to w); if the character is not upper case we add 2, so that e goes to g, 3 goes to 5, and a goes to c.

Quiz 1 Letter Grade Scaling of Numeric Grades