NAME_____

(8)

1. You may use %o0 for the following computation.

(a) Using only clr, mov, add, and shift, write simple code to perform multiplication of the value in %l0 by 0x862, ignoring any overflow that may occur. The result should be in %l1. Do not change %l0.

(b) Using only clr, mov, add, shift, and **sub**, write simple code to perform multiplication of the value in %l0 by 0x3bc, ignoring any overflow that may occur. The result should be in %l1. Do not change %l0.

(6)

2. Assume that we used our macros to allocate space for the following local variables. But do **not** use macros in your answer.

```
char a;    int b;    char c;    short d;
```

Write the SPARC instruction to copy a value from %o0 into each variable.

(1) b.

(2) c.

(3) d.

(2+2+2+5)

3. Assume that we used our macros to allocate space for the following local variables. But do **not** use macros in your answer.

```
struct test {
    char  a;
    short b;
    char  c;
    int   d;
    char  e;
}

char x; short y; int z;
struct test v;
struct test arr[10];
```

(a) What is the align_of_test?

(b) What is the size_of_test?

(c) Using the frame pointer and an actual constant, write the address of v.e.

(d) Write assembly code to do the following: arr[5].d = z;

(3)

4. Register %l0 contains a negative integer. Write simple assembly code to change it to a multiple of 4 less than or eaqual to the current value.

(3x3)

5. Consider the 8-bit binary representation of integers using two's complement. Write the settings of the four integer condition code bits after each of the following computation.

(a) a + b, where a=0x20 and b=0xe0

(b) a + b, where $a=-2^7$ and $b=-(2^7-1)$

(c) a - b, where $a=2^6+1$ and $b=-(2^7-2)$

(6+2+2+2+3)

6.

(a) In a stack frame, four meaningful things are involved in general. List them from the top of stack with their sizes if known.

(b) When we use 'save', the register window is changed. What do we use to go back to the previous window?

(c) Suppose that we have 8 register sets (7 - 0). Currently CWP is pointing to register-set 5 and WIM is pointing to register-set 0.

(c-1) After 'save' instruction, what are CWP and WIM pointing to?

(c-2) After 'save' instruction, which registers of register-set 5 are we still using?

(d) Suppose that we have 8 register sets (7 - 0). Currently CWP is pointing to register-set 0 and WIM is pointing to register-set 6. When window overflow occurs the next time without underflow occurring, which register-set's which registers' values go to the memory?

(5)

7. For the following integer array mapped in row major order:

```
int  ary[d1][d2][d3];
```

where d1, d2, and d3 are constants, write simple code to get the value of ary[i][j][k] into %l0. Assume that the subscripts are in registers %i_r, %j_r, and %k_r, and the stack offset of ary is ary_s. You may use '.mul' here though in reality you shouldn't. You may use %o0. Do not use other macros.

(6)

8. Using mulscc (without .mul), write code to perform signed 32-bit multiplication to produce 64 bits of result. The multiplicand is in %o2, the multiplier is in %o0, and the result should go to %o1 (most significant word) and %o0. You may indicate a repetition of a same instruction by the number of repetition.