Name: _____

**CS 33003** **Exam #3** **CompOrg**

**Friday 13 November 1998**

1. Given the following C code fragment:

```
if (a < b)
    a = b + 2;
else
    a = b + 4;
```

In the space below, translate this code fragment into the book's LOAD / STORE format. Assume that space has already been allocated for variables *a* and *b* earlier in the program, and they have been given initial values. (20 points)

2. Given a 32-bit value in register R3, write a one-instruction code fragment in the book's LOAD / STORE format that will set the 8 most significant bits to all zeros, and leave the remaining 24 bits untouched. Indicate a binary value by preceding it with "b", as in "#b10000000" for $128_{10}$. (5 points)

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3. In the space below each of the following 3 statements, explain what the statement does, making it clear to me that you understand the difference between them. (5 points each = 15 points)

   a. .equate x 100

   b. x: .reserve 100

   c. x: .word 100

4. Given the following C code fragment, where *arr* is an array of 5 ints:

```
for (i=0; i<5; i++)
    arr[i] = i;
```

   In the space below, translate this code fragment into the book's LOAD / STORE format, using indexed addressing to access the array *arr*. Assume that uninitialized space has already been allocated for variable *arr* earlier in the program, and *i* can be held in register R0. (20 points)

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5. Given the following assembly language code fragment, which begins execution at label "main":

```
sub1:  …
       JSR    sub2,R31
       …
       JUMP   @R31

sub2:  …
       …
       JUMP   @R31

main:  …
       …
       JSR    sub1,R31
       …
       …
```

   a. What problems will occur when the code executes? Be specific. (10 points)

   b. How can this problem be avoided? (5 points)

6. Show the **5-bit** representation of each of the decimal values below in each of the specified formats. If it is not possible to represent a particular value in a particular format, write "not possible" in that location. (15 points)

| Value | Signed Magnitude | Excess 16 | 2's Complement |
|---|---|---|---|
| **16** | | | |
| **15** | | | |
| **2** | | | |
| **–15** | | | |
| **–16** | | | |

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7. This question concerns the SPARC architecture.

   a. What does the instruction “ld [%l3+%l4],%l5” do? (5 points)

   b. What does the instruction “set arr,%l5” do, and what is unusual about this instruction? (5 points)