

The University of Alabama in Huntsville
Electrical and Computer Engineering Department
CPE 221 01
Fall 2012
Final Exam
December 6, 2012

This test is closed book, closed notes. You may use a calculator. You should have the reference packet that includes Figure 2.10 and Appendix B. You must show your work to receive full credit.

Name: _____

1. (1 point). A _____ maps a high-level language into machine language constructs.
2. (1 point) The _____ forms the interface between the program and the functional units of the computer
3. (1 point) _____ mimic hardware performance in software, they are usually slower in operation by orders of magnitude
4. (1 point) A 1 address instruction has a register, called the _____ to hold one operand & the result.
5. (1 point) RTN is a _____ language – a language used to describe a language.
6. (4 points) `r2` contains a value of -39452 in decimal. What is the binary value of `r1` after this instruction is executed?

```
not r1, r2
```

7. (4 points) `r2` contains a value of -5179 in decimal. What is the binary value of `r1` after this instruction is executed?

```
neg r1, r2, 4
```

8. (4 points) `r2` contains a value of -5179 in decimal while `r3` contains a value of 3058 in decimal. What is the binary value of `r1` after this instruction is executed?

`or r1, r2, r2, r3`

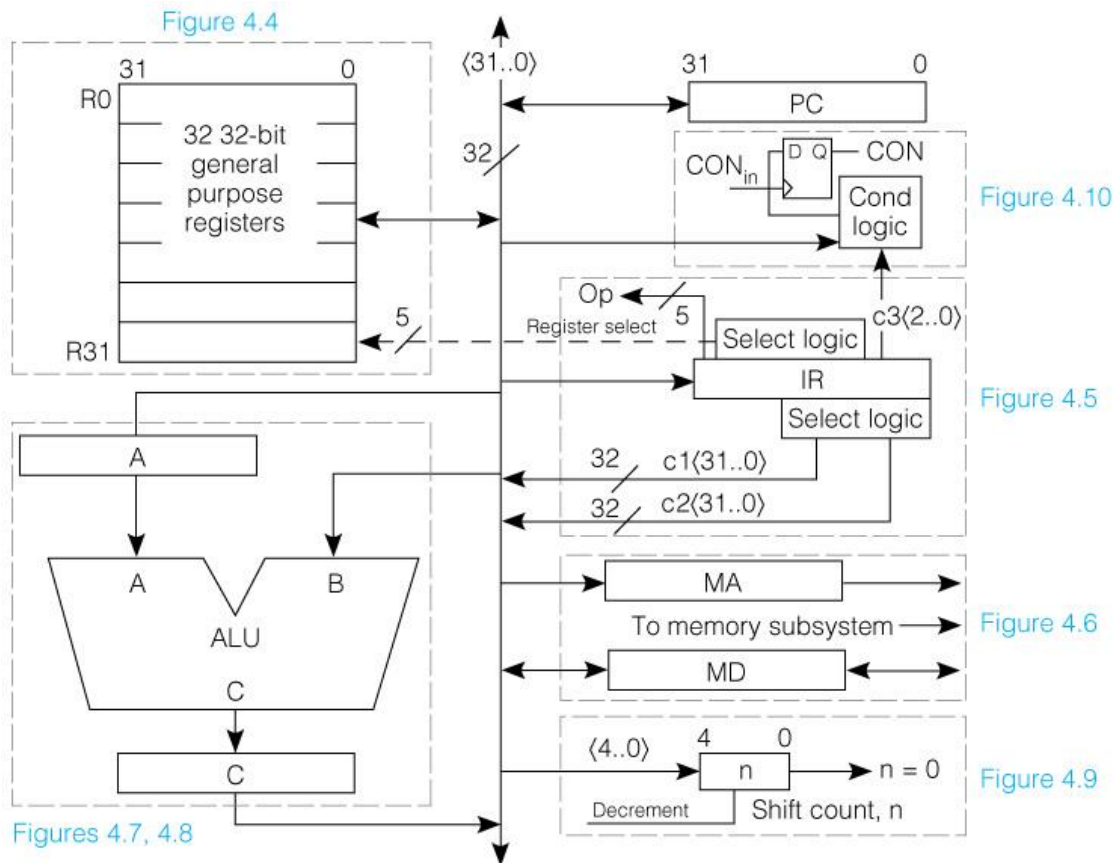
9. (4 points) If we want to examine the last bit of a binary number to see whether it was 0 or 1, we use a mask with a value of 1 and and the mask with the number. What mask value would we use if we wanted to examine bit 9?

10. (10 points) Encode 11001110010 using the Hamming code and odd parity. What is the final Hamming code?

11. (10 points), Extract the correct data value from the odd parity SECEDED string
1111101100011100.

12. (3 points) The fields r_a , r_b , and r_c in the SRC instruction format are 5 bits long. If the register file were enlarged to contain 128 registers, how many bits are required for each of these fields?

13. (15 points) Write concrete RTN steps for the SRC instruction `brzr1` using the 1-bus SRC microarchitecture shown.



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T0	
T1	
T2	
T3	
T4	
T5	
T6	
T7	

16. (25 points) Complete the SRC assembly language program below so that it implements the following C++ statements.

```
int neg_count = 0;
int pos_count = 0;
int size = 10;
int nums[10] = {5, 3, -1, 2, 4, 37, -100, 13, -5, 0};
for (i = 0; i < size; i++)
    if (nums[i] < 0)
        neg_count++;
    else
        pos_count++;
```

```
;
```

This program computes two counts: pos_count – the number of positive numbers and neg_count – the number of negative numbers.

```
;
```

```
                .org 200
size:           .dc 10
neg_count:     .dw 1
pos_count:     .dw 1
nums:          .dc 100, 3, -1, 2, 4, 37, -100, 13, -5, 0
orig:          .org 1000

                lar r10, nums           ; pointer to first element of array
                ld  r1, size            ; holds size of array
                la  r2, 0                ; r4 = 1, index1 into array
```

stop