The University of Alabama in Huntsville
Electrical and Computer Engineering Department
CPE 221 01
Fall 2012
Sample Test 1

1. (1 point) The _____ contains information about the location of the next instruction.

2. (1 point) The design of the storage cells and the interconnections between them is known as the _____.

3. (1 point) A _____ is the address to which control is transferred as a result of a branch instruction.

4. (1 point) A _____ is used to control what is allowed to drive a bus.

5. (1 point) _____ RTN is implementation independent.

6. (5 points) The PowerPC 601 processor addresses a maximum of 2^{48} bytes of memory. What is the maximum number of 32-bit words that can be stored in this memory?

7. (10 points) Represent 227 and -326 as signed 16-bit numbers

8. (20 points) Consider the following SRC program. Trace the values of the registers shown as they change during program execution. Also, trace the writes to memory by the st instruction. There may be unused columns or rows in the tables. If you need to add columns or rows, you may do so.

```
num:   .equ   2000
.org   0
ans:  .dw   num
       la   r4, 0
       la   r3, ans
       lar  r2, loop
       addi r1, r4, 0
       addi r5, r1, 1
loop:  st   r5, 0(r3)
       addi r3, r3, 4
       addi r1, r1, 1
       addi r0, r1, -3
       addi r5, r5, 1
       brmi r2, r0
```

	Initial Value	Second Value	Third Value	Fourth Value	Fifth Value
r0					
r1					
r2					
r3					
r4					
r5					

Results of the `st` instruction.

Memory Address	Contents

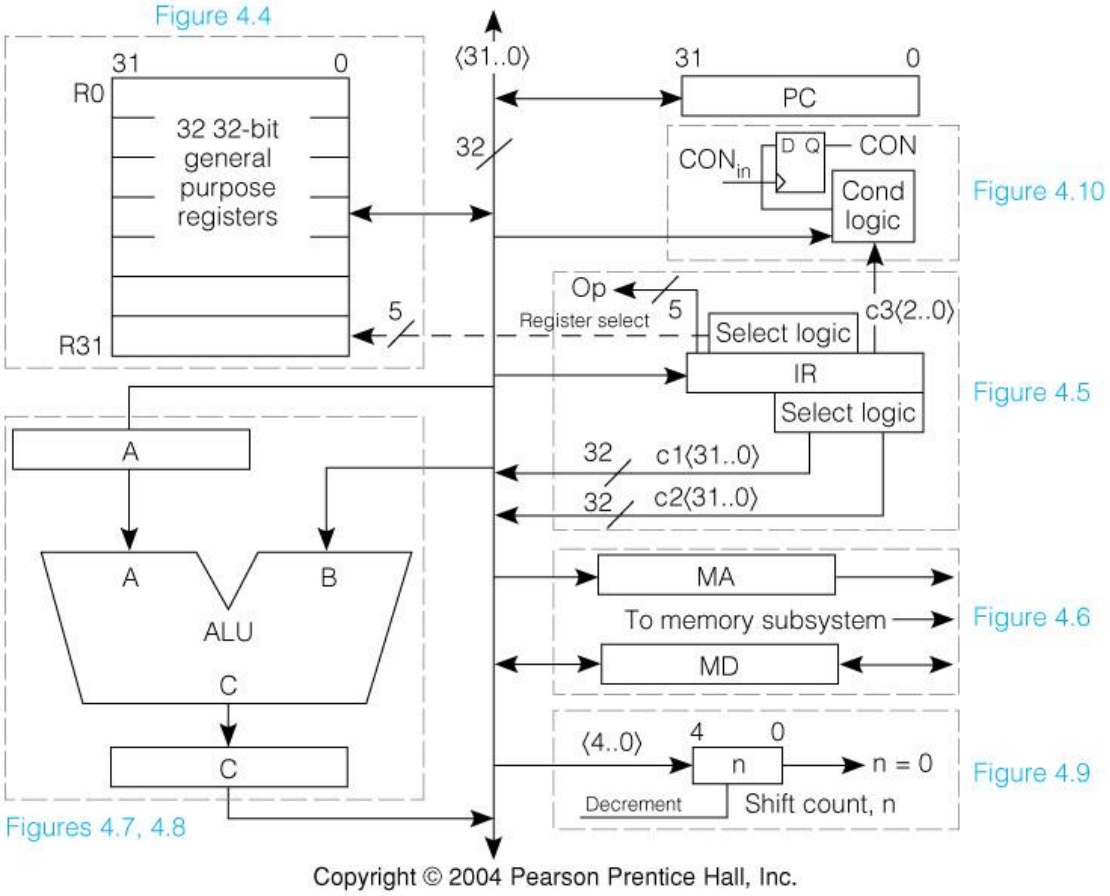
9. (15 points) Encode the selected statements from the SRC program shown below in hexadecimal. dc means declare character (it makes space for a one byte variable).

```
cnt:    .equ  8
        .org  0
seq:    .dc   1
next:   .dc   1
ans:    .dw   cnt
        .org  0x1000
         lar  r31, loop
         la   r0, cnt
         la   r1,  seq
loop:    ld   r2,  seq(r1)
         ld   r3,  next(r1)
         add  r2, r2, r3
         st   r2, ans(r1)\
         addi   r1, r1, 4
         addi   r0, r0, -1
         brnz   r31, r0
```

Address	Label	Instruction	op	ra	rb	rc	c1	c2	c3	Hexadecimal
		`lar r31. loop`								
		`add r2, r2, r3`								
		`brnz r31, r0`								

10. (25 points) Write the code to implement the expression A = ((B + C)*D) – (E/F) on 3-, 2-, 1-, and 0-address machines. Do not rearrange the expression. In accordance with programming language practice, computing the expression should not change the values of its operands.

11. (20 points) Write concrete RTN steps for the SRC instruction lar using the 1-bus SRC microarchitecture shown.



T0	
T1	
T2	
T3	
T4	
T5	
T6	
T7	
T8	
T9	
T10	