**CS 383 Midterm Exam 1 Solution 100 Points**

1. (14 Points)
2. (7 Points) 50% saving
3. (7 Points) Energynew /Energyold = (V \* 1/2)2 \* 0.5 \*F /(V2\*F) = 1/8 = 0.125. That is 87.5% saving

2. (12 Points). Any four of the following:

* Reduced chip size
* Lower cost
* Better performance
* Reduced power consumption
* Higher clock rates
* Less defect per cm2 (and so per chip), and
* Lower cost per transistor

3. (18 Points)

1. (9 Points) CPU Time (P1) = 5 × 10 9 × 0.9/(4 × 10 9 ) = 1.125 s

CPU Time (P2) = 10 9 × 0.75/(3 × 10 9 ) = 0.25 s

Clock rate (P1) > clock rate (P2), but

Performance (P1) < performance (P2)

1. (9 Points) CPU Time (P) = No. instr. × CPI/clock rate

CPU Time (P1) =1 × 10 9 × 0.9/(4 × 10 9 ) = IC x 0.75/(3 x 10 9)

IC of P2 = 9 × 10 8

4. (14 Points)

Since registers X are 64-bit registers,

There is an overflow if 128 + X1 > 2 63 − 1.

In other words, if X1 > 2 63 − 129.

There is also an overflow if 128 + X1 < −2 63

In other words, if X1 < −2 63 − 128

5. (14 Points)

// X9 = A[i]

LSL X9, X3, #3

ADD X9, X6, X9

LDUR X9, [X9, #0]

// X10 = A[j]

LSL X10, X4, #3

ADD X10, X6, X10

LDUR X10, [X10, #0]

ADD X9, X9, X10 // compute A[i] + A[j]

STUR X9, [X7, #64] // store the result in B[8]

6. (14 Points)

R -type

SUB X17, X13, X15

(110 0101 1000) (01111) (000000) (01101) (10001)

1100 1011 0000 1111 0000 0001 1011 0001

7. (14 Points)

LDUR X14, [X13, #0]

LSL X11, X14, #4

STUR X11. [X13, 0#]