Computer Science 315
Spring 2016
Computer Architecture
Homework #3 Solutions

1) a) Convert 5723 from decimal into binary

0001 0110 0101 1011

b) Convert 2235 from decimal into hexadecimal

8BB

c) Convert 0110 1001 from binary into decimal

105

d) Convert 0xF2C4 from hexadecimal into decimal

62148

e) In an 8-bit system find the two's complement representation of the decimal value -41.

1101 0111

f) In a 16-bit system find the two's complement representation of the decimal value -11.

1111 1111 1111 0101

2)

```
r-type, add $s0, $s0, $s0
```

3)

```
fib:   addi $sp, $sp, -12       # make room on stack
       sw   $ra, 8($sp)         # push $ra
       sw   $s0, 4($sp)         # push $s0
       sw   $a0, 0($sp)         # push $a0 (N)
       bgt  $a0, $0, test2      # if n>0, test if n=1
       add  $v0, $0, $0         # else fib(0) = 0
       j rtn                    #
test2: addi $t0, $0, 1          #
       bne  $t0, $a0, gen       # if n>1, gen
       add  $v0, $0, $t0        # else fib(1) = 1
       j rtn
gen:   subi $a0, $a0,1          # n-1
       jal  fib                 # call fib(n-1)
       add  $s0, $v0, $0        # copy fib(n-1)
       sub  $a0, $a0,1          # n-2
       jal  fib                 # call fib(n-2)
       add  $v0, $v0, $s0       # fib(n-1)+fib(n-2)
rtn:   lw   $a0, 0($sp)         # pop $a0
       lw   $s0, 4($sp)         # pop $s0
       lw   $ra, 8($sp)         # pop $ra
       addi $sp, $sp, 12        # restore sp
       jr   $ra

# fib(0) = 12 instructions, fib(1) = 14 instructions,
# fib(N) = 26 + 18N instructions for N >=2
```