University of Arizona, Department of Computer Science

CSc 340 Foundations of Computer Systems — Homework 2

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Due Tuesday, February 13, 9:30am

1. Add the following numbers (assuming that they are represented in 2's complement) and write the value obtained in both binary and decimal and in case of overflow state it explicitly.
   (a) 1100 ; 0111
   (b) 0110 ; 1110
   (c) 01011 ; 10011
   (d) 11001 ; 00111
   (e) 10100 ; 11001
2. Write the truth table giving all possible input combinations and the corresponding outputs for the expressions:
   (a) A and (B or C)
   (b) A nand (B nor C)
   (c) A xor (B or C)
   (d) A xnor (B xnor C)
   (e) A and (B and (C or D))
3. Write MIPS assembly code to execute the following pseudo code

```
R1 = 0x1010
repeat {
   R1 = R1 << 1
} until (R1 != 0)
```

   Note: In a repeat until loop the body of the loop is executed at least once and the moment the end condition (i.e. ⌜R1==0⌝ in this case) becomes true we stop executing the loop.
4. Give the pictorial representation of memory for the following code:

```
.data
.align 2
.byte 'A'
.short 311
.word 10
.align 2
.byte 'B'
.short 8990
.word 20
.align 2
.byte 'C'
.short 30111
.word 30 .word 0x23f
```

5. Assume that we have an array of integers (words), representing the coefficients of a polynomial:

```
poly:    .word 5        # coefficient for x^3
         .word 4        # coefficient for x^2
         .word 1        # coefficient for x^1
         .word 2        # coefficient for x^0
degree:  .word 3
```

The polynomial in this example is $5x^3 + 4x^2 + x + 2$. The `degree` variable indicates that the first number is the coefficient for $x^{\texttt{degree}}$.

Write a MIPS routine that takes a value for x (in register `$s0`), evaluates the polynomial for this x, and prints out the resulting value.