

Lecture Midterm Exam
COMP 122/L
Summer 2020

Score breakdown:

Common data representation: 18 Points

Common binary operations: 32 Points

Floating point representation: 39 Points

ARM assembly: 11 Points

Total: 100 Points

There are 20 questions in all; there is no need to complete them in order.

Common Data Representation

1.) (2 pts) In hexadecimal, how much is a B in position 3 worth? Write a formula which evaluates to the answer.

2.) (2 pts) In binary, how much is a 1 in position 7 worth? Write a formula which evaluates to the answer.

3.) (4 pts) Convert decimal 213 into two-digit hexadecimal.

4.) (4 pts) What is decimal -27 in two's complement notation? Represent your answer using 8 bits.

5.) (6 pts) What is the two's complement number 1101 0001 in decimal? The space in between is only for readability.

Common Binary Operations

6.) (2 pts) Using only the binary shift left operation, how can one multiply a number by decimal 16?

7.) (6 pts) Add the following two 8-bit binary numbers, producing an 8-bit result. Indicate the status of the carry and overflow bits at the end of the addition by circling the appropriate choices. The space in between is only for readability.

```
      1101 0110
+     1001 0111
-----
```

Overflow?	Yes	No
Carry?	Yes	No

8.) (6 pts) Add the following two 8-bit binary numbers, producing an 8-bit result. Indicate the status of the carry and overflow bits at the end of the addition by circling the appropriate choices. The space in between is only for readability.

```

      1111 0010
+   1101 0110
-----

```

Overflow?	Yes	No
Carry?	Yes	No

9.) (2 pts) What is:

```

      1010 1101
&   1011 1011
-----

```

10.) (2 pts) What is:

```

      0011 0111
|   1001 1010
-----

```

11.) (2 pts) What is:

```
    0110 0100
  ^ 1010 1101
  -----
```

12.) (2 pts) What is:

```
0110 1101 << 2
```

13.) (2 pts) What is:

```
1100 1010 >>_arithmetic 3
```

14.) (2 pts) What is:

```
1011 1111 >>_logical 4
```

15.) (6 pts) Consider the following Java-like code:

```
int number = <<read number from user>>;
int mask = MASK;
int result = number OP mask;

if (result != 0) {
    print("Bit 9 was set");
}
```

The above code is supposed to print “Bit 9 was set” if bit 9 of number was set to 1. If bit 9 was not set, then this code should not print anything. What hexadecimal value should MASK be, and what bitwise operation should OP be, for the above code to work correctly?

Floating Point Representation

16.) (23 pts) What is the 32-bit binary floating-point representation of decimal -247.125 ? Show all work.

17.) (16 pts) What is the decimal representation of the following 32-bit floating point value? Spaces have been added only for improved clarity. Show all work. You may write a formula that evaluates to the final value instead of the value itself, if you prefer.

0100 0101 0000 0000 0001 1100 0000 0000

ARM Assembly

18.) (3 pts) What is wrong with the following code, if anything?

```
.equ Exit, 0x11
.equ Open, 0x66
.equ Close, 0x68
.equ Read_Int, 0x6C

.data
filename:
    .asciz "myFile.txt"

.text
.global _start
_start:
    ldr r0, =filename
    mov r1, #0
    swi Open
    swi Read_Int
    swi Close
    swi Exit
    .end
```


19.) (6 pts) Consider the following code, which sets up a `.data` section:

```
.data
label1:
.word 0, 255
label2:
.asciz "a"
```

Assuming the `.data` section starts at address 0, how does this look in memory? Use the following table as a template. Each value should be represented with a two-digit hexadecimal number, and the preceding `0x` may be omitted. As a hint, the ASCII value of `'a'` in hexadecimal is `0x61`. If the value at a given index is unknown, mark the position with `?`.

Value												
Index	0	1	2	3	4	5	6	7	8	9	10	11

20.) (2 pts) What value will be in register `r0` at the end of the following code?

```
mov r0, #0
mov r1, #57
cmp r1, #100
addmi r0, r1, #3
```