**COMP1411 (Spring 2021) Introduction to Computer Systems**

Individual Assignment 1 Due Date: 10:00am, 8th March, 2021

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| *Name* |  |
| *Student number* |  |

**Question 1**. [20 marks]

Suppose that x and y are unsigned integers.

**Rewrite** the following C-language statement by using << and -.

y = x \* 50;

Introducing new variables (other than x and y) is not allowed.

Show your steps.

*Answer*:

**y = x \* (64 - 14) = x \* (64 -8 – 4 - 2); y = (x << 6) – (x << 3) – (x << 2) – (x << 1);**

**Question 2**. [30 marks]

Suppose that x, y and z are all 32-bit unsigned integers.

1. Write C-language statements to set the value of z, such that the left-most 14 bits of z are the same as the left-most 14 bits of x, and the right-most 18 bits of z are the same as the rightmost 18 bits of y.

No that you are only allowed to use bit shift operations and logic operations (including bitwise operators, such as | ^ &) to set the value of z; no arithmetic or if-then-else test (in any form) is allowed; introducing new variables (other than x, y and z) is NOT allowed.

1. If x = 0x3B1A4359 and y = 0x2585B4C7, what the be the resulting value of z? Please write the value of Z in hex-decimal form starting with 0x.

Show your steps.

*Answer*:

**(1)**

**x = x >> 18 and x = x << 18; y = y << 14 and y = y >> 14; z = x | y;**

**(2)**

1. **= 0x3B1A4359 ,Y = 0x2585B4C7**

**As we can list X = 0011 1011 0001 1010 0100 0011 0101 1001**

1. **= 0010 0101 1000 0101 1011 0100 1100 0111**

**So z’s left \*3 nibbles equal to x**

**Z’s right \*4 nibbles equal to y;**

**Z’s 4th nibble = 1st two bits of x’s 4th nibbles and the last 2 bits of y’s 4th**

**So I list the Z = 0011 1011 0001 10 01 1011 0100 1100 0111**

# So answer is 0x3B19B4C7

**Question 3**. [25marks]

**Convert** the following IEEE single-precision floating point number (32-bit)

1 01111110 10110110000000000000000

to a decimal number.

Show your steps.

*Answer*:

**exp = 01111110 (2) = 126 (10) E = 126 (10) -127 (10) = -1 (10)**

**M = 1.10110110000000000000000 (2)**

**V = E \* M \* 2^E**

**= (-1) \* ((1/2^1) \* (1/2^2) \*(1/2^4) \*(1/2^5) \*(1/2^7) \* (1/2^) ) = -0.85546875**

**Question 4**. [25 marks]

**Convert** the decimal number 77.61328125 into IEEE single-precision floating point number (32bit).

Show your steps.

*Answer*:

**77.61328125 (10) = 1001101.10011101 (2)**

**= 1.00110110011101 (2) \* 2 (10)^6**

**So frac=0011 0110 0111 0100 0000 000**

**Exp = 6 (10) + 127 (10) = 133 (10) = 1000 0101 (2)**

**The number is positive,**

## So the number = 0 10000101 00110110011101000000000