*Thanapoom Phatthanaphan*

**5.2**

**a. Find the 16-bit 2's complementary binary representation for the decimal number 1987.**

**Solution:**

| | |
|---|---|
| 1987 / 2 = 993 | remainder **1** |
| 993 / 2 = 496 | remainder **1** |
| 496 / 2 = 248 | remainder **0** |
| 248 / 2 = 124 | remainder **0** |
| 124 / 2 = 62 | remainder **0** |
| 62 / 2 = 31 | remainder **0** |
| 31 / 2 = 15 | remainder **1** |
| 15 / 2 = 7 | remainder **1** |
| 7 / 2 = 3 | remainder **1** |
| 3 / 2 = 1 | remainder **1** |
| 1 / 2 = 0 | remainder **1** |

$1987_{10}$ = 11111000011

As 1987 is the positive number, the 16-bit 2's complementary binary representation for the decimal number 1987 is 0000011111000011.

**Answer: 0000011111000011**

**b. Find the 16-bit 2's complementary binary representation for the decimal number -1987.**

**Solution:**
From (a): $1987_{10}$ = 11111000011

*From 1's complement method: Covert every 0 to 1 and every 1 to 0*

$-1987_{10}$ = 00000111100

*From the equation: 2's complement = 1's complement + 1*

$-1987_{10}$ = 00000111101

As -1987 is the negative number, the 16-bit 2's complementary binary representation for the decimal number -1987 is 1111100000111101

**Answer: 1111100000111101**

**c. From your answer in (b), find the six-digit 16's complement hexadecimal representation for the decimal number -1987.**

**Solution:**
As the answer from (b): $-1987_{10}$ = 1111100000111101

| 1111 | 1000 | 0011 | 1101 |
|------|------|------|------|
| F    | 8    | 3    | D    |

F83D

Therefore, the six-digit 16's complement hexadecimal representation for the decimal number -1987 = FFF83D ; Add two of "F" to the left of the number because this is the negative number.

**Answer: FFF83D**

*Thanapoom Phatthanaphan*

**5.5 What are the 16-bit 1's and 2's complements of the following binary numbers?**
**a. 10000**

**Solution:**
16-bit of 10000: 0000000000010000

**Answer:**
1's complement (Convert every 0 to 1 and every 1 to 0) : 1111111111101111
2's complement (1's complement plus 1) : 1111111111110000

**b. 100111100001001**

**Solution:**
16-bit of 100111100001001: 0100111100001001

**Answer:**
1's complement: 1011000011110110
2's complement: 1011000011110111

**c. 0100111000100100**

**Solution:**
0100111000100100 is already in 16-bit format.

**Answer:**
1's complement: 1011000111011011
2's complement: 1011000111011100